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# Index to Volume XXXVIII, 1922


Accidents, Fatal, Toll of, Reaches High Mark 756
Accidents, Railroad Crossing, by H. H. Windsor ..... 866
Accidents:
Automobile Steering Wheel Lock Causes Man to Lose His Life..... 410
Boats, Two, Collide on Columbia River... 207
Buildings, Two, Collapse with No Injuries 876
Electric Light Bulb Kills Scrubwoman... 664
Tree, Falling, Kills Horse and Misses Driver ..... 549
Accouterments, Ancient Japanese Battle, Presented to Vanderbilt University, Tenn. 111
Acetylene and Oxygen Tanks, Handling of 797
Acetylene Does Not Affect Cyanide Solutions 98
Acetylene, Pressure Required for..... 125
Acid, Sulphuric, Simple Process for Making 376
Acorns Used to Fatten Hogs and Poultry... 836
Adjuster, Linotype Slug, Has Antifriction Roller ..... 609
Advertising Appliances:
Lighting Principles, Suitcase Outfit Shows 239
Lumber Truck Cab Resembles Miniature House ..... 269
Name, Oddity of, Made Advertising Slogan 450
Phonograph Needle, Huge, Six Feet Long 695
Pipe, Large, on Bicycle Advertises Shop.. 725
Railway, Miniature, Demonstrated at English Exhibition ..... 35
Window Display, Clever, for Fishing Season ..... 426
Aerial, New Transatlantic Wireless, Strung on Telegraph Poles, by Bernard G. Priestley ..... 17
Aerial Pole, Wireless, Erected by One Man.. 366
Aerial, Ready Made Wireless, Now on the Market ..... 778
Aerial Tax Assessment Maps Convenient... 208
Aerial, Wireless, Electric Wiring in Homes Used as ..... 171
Aerial, Wireless Loop, Used in Steel Train.. 868
Aeromobile, Neat, Driven by Motorcycle Engine ..... 83
Aeronautics:
Air Craft Engine Establishes New Endurance Record ..... 879
Air Craft, Nationality and Registry Marks for ..... 358
Airplane Aids in Locating Unchartered Lakes ..... 554
Airplane Ambulance, Flying Fields to Have ..... 424
Airplane, America's Largest Man Rides in 820
Airplane, Bombing, Largest in America Tried Out by U. S. Army..... 886
Airplane Camera, Efficient High Speed, for Making Aerial Maps..... 36
Airplane Cameras, Two New, Developed by Experts ..... 23
Airplane Cockpit, Modern, Is Mass of Instruments and Controls..... 276
Airplane Contest, Commercial, "Italy's Great Trophy" Offered in..... 163
Airplane Controls, Recording Device Shows Position of ..... 219
Airplane Engine, Crude Oil, Developed in England ..... 858
Airplane Engine, Rebuilt, Systematically Tested ..... 920
Airplane Express, Non-Stop, Landing from, by R. C. Folger..... 510
Airplane Fitted Up like Office for Business Man ..... 762
Airplane Fliers, around the World, Halted in India ..... 520
Airplane, Flight of, Shown by Gyroscope Instrument ..... 778
Airplane Flight, One Stop, from Florida to Calif. ..... 688
Airplane, Forest Fire Fighters Aided by.. 494
Airplane Fuel, Petroleum Used as..... 769
Airplane Landing Field Indicator, Luminous, Aids Night Flying..... 864
Airplane Landing Gear Dropped in Flight 695
Airplane Lands in Grand Cañon, by R. C. Folger ..... 838
Aeronautics: (Continued)
Airplane, Loening, Makes Fast Trip from Florida to New York..... 215
Airplane Motors, Liberty, Improved..... 774
Airplane Parts, Toy, for Assembling..... 942
Airplane Pressures, Multiple Manometer Records ..... 666
Airplane Race, Pulitzer, to be Made Over Water Instead of Land..... 819
Airplane Speed, Accurate Instrument for Timing ..... 723
Airplane Speed of Four Miles a Minute, by H. H. Windsor..... 865
Airplane Station, Famous Trading Post Made into ..... 669
Airplane Stowaway, First, Arrives in Cleveland ..... 502
Airplane Stresses, New Instrument Records 506
Airplane Taxi Service at Croydon Air Station ..... 76
Airplane Test Flight at Night on Continental Route ..... 99
Airplane, Toy, Made of Cardboard Wins Prize ..... 285
Airplane Wind Tunnel for Testing Models 721
Airplane Wind Tunnel, New Type, by Bernard G. Priestley ..... 77
Airplane Wings, Method of Testing, by Flying in Air..... 95
Airplanes, American, Fastest in the World 516
Airplanes, Giant, to Carry 100 People 500 Miles ..... 558
Airplanes, Mail, Efficient Service of..... 722
Airplanes, Model, How to Build..... 149
Airship Hangar, Giant, Completed in Texas 420
Airship Mooring Mast, New Navy, by Ernest Jones ..... 692
Airship, New Design, to Use Nonexplosive Gas ..... 9
Airship, Wreck of, Lands Crew in Sea.... 609
Balloon Race, International, Ends in Doubt ..... 516
Balloon Stunt, Thrilling, by European Dare Devil ..... 922
Balloons, Models of Dirigible, Method of Testing ..... 225
Biplane, Army, Wins Air Race with Record Speed ..... 853
Biplane, Six Passenger, First American Constructed ..... 665
Dirigible, Army, Destroyed after First Trip ..... 852
Dirigible Disasters, by H. H. Windsor.... 865
Flight, around the World, British Airmen Start ..... 186
Flight, around the World, Halted in India 520
Flight, Oceanic, Portuguese Airmen Finish 191
Flight, One Stop, from Florida to Calif.. 688
Flight, Test, at Night on Continental Route ..... 99
Glider, British, Soars Nearly Two Hours. 868
Glider, Experimental, Built for Technical School ..... 220
Glider, Motorless, Flies Five Minutes.... 365
Gliders a Fad, by H. H. Windsor..... 704
Gliders and Soaring Flight, by R. C. Folger 679
Helicopter, Man Carrying, Makes Short Flight ..... 181
Hydroglider, Speedy French, Resembles Huge Fish ..... 333
Monoplane, Army "Bus," Built on Foreign Lines ..... 410
Seaplane, Giant, Carries 27 Persons..... 48
Seaplane, New, Named for Wilbur Wright 845
Seaplane, Small, Turned Out in Germany. 525
Seaplane, U. S. Navy Is Developing for Land ..... 535
Seaplanes, Kites on, to Carry Wireless Antenna ..... 96
Seaplane Now Essential in Naval Maneuvers ..... 705
Seaplanes, Passenger Service, Makes Record Flight from New Orleans and Chicago ..... 71
Triplane, Tandem, Has Noteworthy Features ..... 175
"Age Hardening," Alloys Made Valuable by. 8




419389

Agricultural Implements:
- Cherry Picker, Effective Homemade..... 474
- Clod Crusher and Leveler Operates with Harrow ..... 717
- Clover Seed Catcher, Japan..... 290
- Corn Cleaner Removes Shucks and Silk from Ear ..... 663
- Corn Harvester, Homemade Simple..... 624
- Cotton Boll Weevil, Suction Machine Destroys ..... 193
- Cultivator, Homemade Garden..... 475
- Cutter for Strawberry Runners..... 155
- Dandelion Destroyer, Homemade..... 311
- Ditch Digging, Machine Employs Water for ..... 23
- Drill and Marker, Small, for Garden Use.. 678
- Garden Set Has Five Tools for One Handle 584
- Grain Binder, New, Cuts 35 Acres Per Day 739
- Harrow Prevented from Injuring Trees... 475
- Harrow, 24 Foot, Drawbar for..... 463
- Hayrakes, Motor Truck, Function Efficiently ..... 35
- Hoe Cleaner, Novel..... 162
- Incinerators, Preambulating, in California Vineyards ..... 708
- Orchard Heater Burns Carbon Briquettes. 368
- Plow, Self-Propelling, with Rotating Shares ..... 271
- Plowshare, Runner for..... 780
- Potato Digging Machine Picks, Cleans, and Sacks in One Operation..... 237
- Potato Plant Sprayer Mounted on Motorcycle ..... 226
- Rake, Litter, Made from Pitchfork..... 317
- Shock Loader Economical for Farmer..... 908
- Shocker, Automatic Grain, Works Successfully ..... 173
- Spray Pump, Garden Hose as Substitute for ..... 318
- Sprayer, Angular Nozzle, for Underside of Leaves ..... 567
- Spraying Machine Strainer Prevents Clogging ..... 112
- Spraying Outfit, Wheelbarrow..... 143
- Sugar Beet Harvester, Automatic..... 543
- Thresher Grain Spout, Automatic Shut Off for ..... 142
- Thresher, Pea and Soy Bean, Used with Grain Binder ..... 280
- Tobacco Gathering Machine Saves Hand Labor ..... 85
- Tractor Clutch Yoke, How to Repair..... 959
- Tractor, Crane Attached to, Aids Farmer.. 921
- Tractor, Device Converts, into Ditch Digger ..... 885
- Tractor, Device Prevents from Turning Backward ..... 270
- Tractor Dynamometer Gives New Soil Tillage Data ..... 594
- Tractor, Front End of, Increasing Weight of ..... 134
- Tractor, Gasoline, Pulls Four Mowers at Once ..... 60
- Tractor, Radiator Guard for..... 618
- Tractor, Soft Ground, Propelled by Feet.. 521
- Tractor, Truck Converted into..... 399
- Tractor, Winch on, Performs Heavy Labor 39
- Tractor, Wire Fences Stretched with Aid of ..... 500
- Tree Pruning Chisel, Long Handled..... 94

Agriculture:
- Apple Tree Buds, Seedless, to Propagate New Variety ..... 103
- Apples, All Winter, Developed at State Fruit Farm ..... 203, 820
- Barley, New Variety, Has Striking Qualities ..... 113
- Citrus Trees, Root Fungus Treatment to Save ..... 416
- Daisies, Cultivation of, a Paying Enterprise ..... 720
- Farm, Miniature, Shows Possible Crop Rotation ..... 513
- Fruit Preserving Process Saves Crop..... 379
- Fruit Trees Injured by Winter Sun..... 952
- Grapevine Roots Planted with Electric Drill ..... 233
- Marshland, Italy to Drain, Unused for 2,500 Years ..... 910
- Orange Groves, Central Heating System for ..... 499
- Peaches Resemble Pumpkins on Ohio Fruit Farm ..... 382

Agriculture: (Continued)
- Rice Farm Labor, Oriental, becoming Harder, by Lawrence Wm. Pedrose..... 255
- Seed, Amount of, in India Produced for Various Oils ..... 249
- Seed, Kentucky Blue Grass, Is Valuable By-Product ..... 338
- Sugar Cane Industry, Improved Process Devised in ..... 206
- Timothy, When to Harvest for Hay..... 469
- Watermelons Grown Under Hay, Straw, and Canvas ..... 748

Air, Brazilian Mine, Needs Precooling..... 658
Air, Compressed, Blasts of, Replaces Loom Shuttle ..... 677
Air, Compressed, Blistered Paint Removed by ..... 663
Air Compressor, Homemade..... 126
Air Cruiser, Loening, Makes Fast Trip from Florida ..... 215
Air Line Gauge for Tires Prevents Accidents 710
Air Motor, Double Cylinder, Smaller than Match Box ..... 268
Air Release for Inner Tubes..... 315
Airmen, British, Start Flight around the World ..... 186
Airmen, Portuguese, Finish Flight across Ocean ..... 191
Airmen, Round the World, Halted in India.. 520
Alarm, Auto Burglar, Homemade..... 476
Alarm, Burglar, Connected to Lighting Circuit ..... 322
Alarm Clock, Electric, Switches on Light.... 114
Alarm, Electric, Kills Man by Excessive Voltage ..... 96
Alarm, Improvised, for Rats..... 309
Alarm, Portable Burglar, Simple and Effective ..... 122
Alcohol, High Thermal Efficiency in, as Fuel ..... 344
Alloy, Low Melting Point, for Diamond Setting ..... 664
Alloys, Fusible, for Setting Crystals..... 811
Alloys Made Valuable by "Age Hardening".. 8
Altitudes, High, Effects of, on Human Beings 440
Aluminum Alloys Made Valuable by "Age Hardening ..... 8
Aluminum Coating Protects Grate Bars..... 574
Aluminum, How to Color Black..... 628
Aluminum, Kerosene as Lubricant for Milling ..... 135
Aluminum Solder Applied without Using a Flux ..... 270
Ambergris, 80 Pounds of, Worth Small Fortune ..... 95
Ambulances, Aero, Flying Fields to Have... 424
Americanism, Essays on, Prizes Offered for. 327
Amphitheater Illuminated by Exterior Lights 551
Amplifier, Two Step Audio Frequency, How to Make ..... 157
Amplifier, Universal Wireless, Aids Communication ..... 2
Amplifier, Wireless Sound, Made from Phonograph ..... 145
Amplifier, Wireless, Phonograph Sound Box Used as ..... 688
Amplifiers, Tone, on Upright Pianos..... 440
Anchor Hoisting Winch for Seaplanes Tested by Navy ..... 896
Anemometers, Tests Made of, to Detect Their Errors ..... 920

Animals:
- Bear, Escaped, Novel Method of Capturing 8
- Beavers Menace Irrigation by Damming Ditches ..... 224
- Dog Holds Bottle of Milk for Baby..... 613
- Dog Listens In on Wireless..... 284
- Dog with Back Broken Bound in Splints.. 120
- Elephant, Circus, Does the "Shimmy"..... 777
- Elephant Family Group, Largest African.. 273
- Goats, Team of, Travel 1,800 Miles..... 449
- Gophers, Two, Pose for Their Picture..... 776
- Hogs Thrive on Cat Tail Growths..... 4
- Horse Breaking Still a Big Business, by Florence L. Clark..... 249
- Horse Saved by Clamshell Crane..... 16
- Horse, Weakened, Supporting Rig for..... 432
- Lambs, Orphaned, Cow Nurses..... 776
- Porcupine and Coon Meet on Same Tree Branch ..... 612
- Reindeers Branded by Notches in Ears... 444
- Squirrel Collection, Finest, Kept in Beautiful Home ..... 569

419389




Animals: (Continued)
Squirrel Stands Up and Eats from Man's Hand ... 121
Walrus Hides Valuable for Polishing Metal ... 830
Annealing Machine, Rapid ... 468
Annunciators for Group Machine Operators. 456
Antenna, Longest Wireless, Oregon Lumber Camp Boasts ... 530
Antenna, Wireless Cage, New Type ... 652
Anvil, Blacksmith's Vise for ... 464
Anvil, Soft Metal ... 300
Applause Stimulator for Use in Theaters ... 729
Apple Tree Buds, Seedless, to Propagate New Variety ... 103
Apple Tree Enclosed in Fence Is Oldest in Northwest ... 439
Apples, All Winter, Developed at State Fruit Farm ... 203, 820
Apples Monogrammed in Western Orchard .. 710
Applewood for Smoking Meats ... 477
Arbo, H. S.: Bridge "Boosting"—a New Job for Dynamite ... 11
Arbor, Lathe, Drill Used as ... 304
Arbor Saw Bench, Tilting, Direct Motor Driven ... 92
Arbor, Self-Gripping, How to Make ... 137
Arbor, Special Threading ... 465
Arbors, Preventing Damage to ... 961
Arc Lamp, Mercury Vapor, Self Starting ... 182
Arc Lamp, Tungsten, Has One Point Light .. 58
Arc Welder, Electric, Has Automatic Feed .. 378
Arch, Artistic, for San Francisco Viaduct ... 603
Archaeological Explorer, Work of, by F. W. Hollingsworth ... 595
Archaeology, Modern Machinery Promotes Work in ... 822
Arches, Concrete Bridge, Built by New Method ... 549
Arithmetic, Spinning Top Teaches to Children ... 450
Armature Trouble, Unusual, Finding ... 782
Armor Grinding Machine, Largest in the World ... 772
Armor Suits, Curious, of Gilbert Islanders ... 588
Armrest for Draftsmen ... 625
Army Balloon Pilots, Training Camp Established for ... 937
Army—Liaison System, Prizes for Best, Between Artillery and Infantry ... 655
Art, Kindred, Excellence in, Medals Awarded for ... 820
Art, Study of, Projecting Apparatus for ... 393
Artists and Authors, Amateur, Provided Leisure by Society ... 819
Asbestos and Cement Roofing Is Strong and Corrugated ... 71
Asbestos Dams for Babbitting ... 792
Asbestos Roofing, Italian Locomotive Sheds Have ... 429
Ash Removal System, Novel, for Power Plant ... 385
Ashes Removed by and Stored in Water ... 186
Asphalt, Drains Sprayed with, to Control Mosquitoes ... 356
Astronomy:
Planet "Venus," the Future of ... 844
Telescope Reflector, Largest, Cast in America ... 10
Authors and Artists, Amateur, Provided Leisure by Society ... 819
Auto Cycle, Four Wheeled, Propelled like Boat ... 538
Automobile Accidents at Grade Crossings, by H. H. Windsor ... 866
Automobile—Aeromobile Driven by Motorcycle Engine ... 83
Automobile, Aid for Warming Up ... 651
Automobile, American, Makes Attractive Hansom Cab ... 590
Automobile, Armored, for Rum Runners ... 446
Automobile Auxiliary Piping Prevents Overheating ... 801
Automobile, Auxiliary Seat for ... 808
Automobile Axle, Bent, How to Straighten .. 811
Automobile Axle, Stripped Tread on, Emergency Repair for ... 784
Automobile Axle, Stub, for Emergency Towing ... 103
Automobile Baggage Trailer for Touring and Camping ... 63
Automobile Ball Races, How to Break Out .. 960
Automobile Barber Chair for Children ... 612
Automobile Battered, Bent, and Broken Makes Record ... 706
Automobile Bearings, Clamp Aids in Fitting. 462
Automobile Body Built to Imitate Church ... 709
Automobile Body Convertible for Truck or Camping ... 286
Automobile Body, Freak, Built for Comedy Pictures ... 65
Automobile Brake Bands, Relining Fixture for ... 948
Automobile Brakes, Tool for Adjusting ... 309
Automobile Bumper, Self-Acting, Also "Kills" Engine ... 899
Automobile Burglar Alarm, Homemade ... 476
Automobile Bus for Traveling Show Players 33
Automobile Bus to be Used by Chicago Elevated Railway ... 930
Automobile Bus, Upper Deck of, Has Unique Top Piece ... 550
Automobile Busses Equipped with Wireless. 169
Automobile Busses, Large Numbers on, Serve Novel Purpose ... 909
Automobile Camp Sites, Municipal, Along Lincoln Highway ... 182
Automobile Caravansary Is New Industry, by Lawrence Wm. Pedrose ... 523
Automobile Carburetor Heater Vaporizes Heavy Particles of Gasoline ... 773
Automobile Carburetors, Air Cleansing Dust Trap for ... 379
Automobile, Concealed Wireless on, Gives Concert While Driving ... 425
Automobile Control Levers Operate Pneumatically ... 684
Automobile Control Pedals, Operating by Hand ... 798
Automobile Convertible as Bed ... 978
Automobile Crankcase Oil Dilution, Automatic Device Removes ... 99
Automobile Cylinder Head Bolts, Replacing. 474
Automobile Cylinder Head Plugs, Removing. 464
Automobile, De-Luxe, Fitted Up like Parlor Car ... 712
Automobile Disk Wheels, Small Fan Attachment Cools ... 566
Automobile Dog Leash, Safety ... 315
Automobile Drivers, Reckless, Given Name .. 428
Automobile Engine, Handy Device for Priming ... 817
Automobile Engine, Old, Aids Ice Harvest .. 351
Automobile Engine Pistons, Lightweight, with Curbed Expansion ... 904
Automobile Engine Runs Village Water Plant ... 665
Automobile Engine Valves, Overhead, Tool Aids Work on ... 490
Automobile Exhaust Pipe Cooker Has Three Large Pans ... 764
Automobile Exhaust Used for Cooking Purposes ... 239
Automobile Fan Pulley Pin, Locking ... 784
Automobile Flywheel Gears, Fixture for Working on ... 961
Automobile Fuel, Alcohol as ... 344
Automobile Gasoline Attachment Proves Economical ... 229
Automobile Gasoline Vaporizer ... 368
Automobile Gear Changes, Indicator Makes Noiseless ... 227
Automobile Generator Brushes, Small Improved ... 787
Automobile Gradient Meter Mounted on Dash ... 747
Automobile Grease Cups Made Convenient ... 977
Automobile Grease Gun, Air Operated ... 583
Automobile, Handy Oil Gauge for ... 968
Automobile Headlight Attachment for Dark Roads ... 323
Automobile Headlight Bulbs, Preventing Vibration of ... 316
Automobile Headlight Controller Dims Lights Gradually ... 879
Automobile Headlight Rims, Tool for Removing ... 974
Automobile Headlights, Switch Brightens ... 489
Automobile Hoist Lifts Cars in Air ... 735
Automobile Hood Attachment Prevents Rattling ... 608
Automobile Hood, Goose Rides on ... 942
Automobile Ice Carrier Is Simple and Convenient ... 119

Automobile Instruction Unit, for Teaching Owners of Cars ..... 230
Automobile Jack Head Saves Blocking Car.. 484
Automobile Jacks, Blocks for..... 487
Automobile License Bars as Thief Signal... 598
Automobile, Light, Motorcycle and Sidecar Converted into ..... 847
Automobile Lock Closes Exhaust Passage.. 94
Automobile Lock Displaces Transmission Case Cover ..... 432
Automobile Lock Installed in Steering Wheel Hub ..... 354
Automobile Locking Device Causes Fatal Accident ..... 410
Automobile Lubrication, Testing..... 642
Automobile Lunch Box and Table, Folding.. 476
Automobile Mallet, Rubber, Saves Tire and Rim ..... 717
Automobile Match Holder Fastens to Windshield by Vacuum..... 710
Automobile, Method of Pulling Out of Mud.. 802
Automobile—Motor Bus, Elaborate, Is Showman's Home ..... 257
Automobile—Motor Truck for Tourists Fully Equipped ..... 724
Automobile Motors Used in Pumping Outfits 734
Automobile Mud Rim Prevents Skidding.... 2
Automobile, Newly Designed, Resembles Motorcycle with Sidecar..... 534
Automobile Oil Feed Pipe, Cleaning..... 796
Automobile Parking Lamp, Neat..... 400
Automobile Parking Space on Garage Roof. 39
Automobile Pedal Device for Driving with One Foot ..... 326
Automobile Pictures, Interesting, Prizes Offered for ..... 491
Automobile Pump Inflates Tires Using Engine Suction ..... 365
Automobile Radiator Condenser Made in Form of Still..... 254
Automobile Radiator Device, Attractive, Warns of Overheating..... 928
Automobile Radiator, Water Level Indicator for ..... 277
Automobile Radiator Whistle Warns of Overheating ..... 673
Automobile Rear Seat Cover Used as Windshield ..... 350
Automobile Repair Work, Yacht's Rigging Utilized in ..... 551
Automobile Rim Wrench Has Four Sizes of Sockets ..... 58
Automobile Rims, Flower Bed Borders Made from .....316, 475
Automobile Rims, Split, Homemade Remover for ..... 324
Automobile Rims, Split, Spreader for..... 812
Automobile Robe Rolls into Cylindrical Footrest ..... 677
Automobile Route from Juarez to Mexico City being Promoted..... 684
Automobile Running Board, Space Under, Used for Luggage..... 549
Automobile Running Boards, Sagging, Strengthening ..... 653
Automobile Running Gears, Huge Washbowl for Cleaning ..... 178
Automobile Safety Bumper Stops Car Automatically ..... 555
Automobile Sea, Extra, Cylindrical Lunch Box Used as..... 688
Automobile Shock Absorber Works on Lever Principle ..... 260
Automobile Signal Device for Day or Night Use ..... 272
Automobile Signs, Graphic, in Columbus, Ohio ..... 111
Automobile Spare Tire Carrier Lifts Heavy Metal Wheels ..... 86
Automobile Spark Intensifiers, Explanation of ..... 325
Automobile Speed and Flow Meter in One Instrument ..... 716
Automobile Speed Violaters Punished on Huge Rock Pile ..... 274
Automobile Speedway Built Under Difficulties ..... 730
Automobile Spotlights, Crystal Glass Reflectors for ..... 112
Automobile Spring Bushings, Worn, Replacing ..... 146
Automobile Springs, Assembling and Replacing ..... 144
Automobile Springs Oiled in Effective Manner ..... 742
Automobile Springs, Oiling through a Tube. 310
Automobile Starting Gears, Cleaning..... 646
Automobile Starting Gears, Lengthening Life of ..... 640
Automobile Steering Wheel, Mark on, Aids in Manuvering ..... 474
Automobile Step Plate Is Also Suitcase Carrier ..... 415
Automobile Stool, Light Collapsible..... 445
Automobile Stop Signal, Automatic..... 539
Automobile Stop Signal Utilizes Tail Light.. 884
Automobile Supporting Jacks Add to Life of Tires ..... 743
Automobile Suspension, Four Point, Changed to Three Point..... 431
Automobile Taillights, Yellow, May Replace Red ..... 91
Automobile Tank, Auxiliary, Used as Footrest ..... 738
Automobile Temperature Indicator Has Dial on Dash ..... 356
Automobile Testing Apparatus, New, Gives Complete Road Performance Data, by G. H. Dacy ..... 501
Automobile Tilter Aids Repair Workmen... 345
Automobile Tire Blow-Outs, Plugs and Patches for ..... 939
Automobile Tire Casings, How to Keep Water Out of..... 976
Automobile Tire Chain Bag, Handy..... 106
Automobile Tire Chains, Aid for Applying... 645
Automobile Tire Chains, Vacuum Cup..... 53
Automobile Tire Filler, Fool Proof, Prevents Accidents ..... 710
Automobile Tire Valves, Leaky, Method of Testing ..... 152
Automobile Tires, Chest for Storing..... 967
Automobile Tires, Fabric, Amount of Power Loss in..... 95
Automobile Tires, Harness Made from..... 477
Automobile Tires, How to Carry..... 478
Automobile Tires, Machine for Wearing Out. 177
Automobile Tires, Rubber Sandals Made from ..... 227
Automobile Top Head Protector, Inflated Rubber ..... 446
Automobile Top Lining Has Spaces for Clothing ..... 916
Automobile Tops, Handy Hat Holder for.... 280
Automobile Touring Truck Has Many Comforts ..... 188
Automobile Towing without a Towrope..... 310
Automobile Trailer, Tourists', Makes Camping Easy ..... 714
Automobile, Transcontinental Wireless, Makes Fast Trip ..... 508
Automobile, Traveling, Equipped with Many Conveniences ..... 233
Automobile Travels 6,000 Miles Across Empty Continent ..... 725
Automobile Trip, Shirt and Waist Proctector for ..... 494
Automobile Trouble Lamp, Headlight Serves as ..... 475
Automobile Trouble Lamp Installed under Dash ..... 154
Automobile Trouble Lamp Used as Headlight 818
Automobile Truck Brings Ready Cooked Meals to Homes ..... 585
Automobile—Truck Cab, Lumber, Resembles Miniature House ..... 269
Automobile Truck Delivers Gas, Oil, and Air from House to House ..... 533
Automobile—Truck, Electric, Prizes Offered for Slogan for..... 983
Automobile—Truck has Elevating Body for Dumping ..... 590
Automobile Truck Highways, Honduras Now Building ..... 663
Automobile Truck, Private Wireless Set Mounted on, by H. A. Lane ..... 662
Automobile Truck, Road Maintenance, Has Scraper Attachment ..... 49
Automobile Truck Trailer Moves 80 Houses 11 Miles ..... 759
Automobile Trucks, Auxiliary Coil Springs for ..... 697

Automobile Trucks in Tandem Formation Delivered by One Driver ..... 234
Automobile Vacuum System, Testing for Leaks in ..... 483
Automobile Valve Stem, Oil Cup Inside Spring Lubricates ..... 116
Automobile Vaporizer, New, Installed in Manifold ..... 180
Automobile Ventilator, Automatic, Creates No Draft ..... 556
Automobile Water Separating Filter on Gasoline Feed Pipe ..... 270
Automobile Wheel Ball Race, Outer, Removing ..... 289
Automobile Wheel Lock Safeguards Tire Valve ..... 933
Automobile Wheels, Steel Disk, Made in Light Weights ..... 6
Automobile Windshield, Rear Seat, on Automatic Rollers ..... 579
Automobile Windshield, Winking Eye on, as Advertising Novelty ..... 859
Automobile Wrench Has Eleven Different Grips ..... 527
Automobiles, Adjustable Steering Wheel Lock for ..... 4
Automobiles, Combined Horsepower of, in United States ..... 658
Automobiles, Device Holds Safely in Transit 604
Automobiles, Double Horn for ..... 641
Automobiles, Electric, Heel Pedal Control Placed on ..... 419
Automobiles, Hot Water Now Heats ..... 672
Automobiles, Improved Warning Signal for. 244
Automobiles, Knockdown Decking for Shipping ..... 719
Automobiles, New Automatic Life Saving Fender for ..... 576
Automobiles, Old Model, Self-Thawing Oil Pump Drive for ..... 544
Automobiles, "Push Ball" Game Played with 81
Automobiles Seized When in Accident in Paris ..... 391
Automobiles, Small, Adjustable Spring Control for ..... 912
Automobiles, Two, Have Narrow Escape from Falling Tree ..... 242
Automobiles, Useful Hints Regarding..... 980
Automobiles, 200, Enter Formal Opening of Highway at Green Bay, Wis..... 931
Axle, Auto, Stripped Thread on, Emergency Repair for ..... 784
Axle, Bent Auto, How to Straighten..... 811
Axle, Stub Auto, for Emergency Towing.... 103

Babbitt Ladle Made from Wagon Skein.... 465
Babbitt Machine, Bearings Made in Connecting Rods with ..... 103
Babbitt, Making to Run Freely ..... 954
Babies "Crying Room" Built in Theater..... 557
Baby Bath and Dressing Cabinet on Wheels 279
Baby Carriage, Collapsible, for Home or Auto Use ..... 934
Baby Carriage, Gasoline Motor Driven..... 215
Baby Dressing Cabinet Has Many Conveniences ..... 279
Baby's Toy Holder Attachable to Chair..... 278
Bacteria Exhibit of 655 Different Types..... 832
Bacteria in Tears Destroyed by Strange Substance ..... 38
Bag, Chemical Heat, for Many Uses..... 94
Bag, Handy, Automobile Tire Chains Carried in ..... 106
Bag, Leather Traveling, Has Side Compartment for Handy Articles ..... 278
Bag, Transparent Moth-Proof, for Dresses.. 606
Bag, Window Cleaning, Contains Granular Substance ..... 442
Baggage Trailer, Automobile, for Touring and Camping ..... 63
Baggage Truck Wheel Lock, How to Make.. 964
Bags, Cement, Amount of Cloth Used for.. 940
Bags, Empty Cement, Compressed Air Ram for Baling ..... 827
Bait, Fish, Snaps like Animal Trap..... 353
Bake Oven, Electrical, Made in Sections.... 848
Bake Pot with Pans for Use on Gas Flame Stove ..... 606
Balcony and Fire Escape Attractively Combined ..... 664
Baldwin, C. R.:
Orange Groves, Central Heating System for ..... 499
Ball Handles, Jig for Drilling..... 305
Ball, High Carbon Grinding, Gives Good Service ..... 330
Ball Race, Outer, Removing from Auto Wheel ..... 289
Ball Races, Automobile, How to Break Out.. 960
Ball Scale, Golf, Gives Weight and Size.... 941
Ballet Dancer Performs on Typewriter Keys 4
Balloon, Army, Destroyed after First Trip.. 852
Balloon, Dirigible, Reversible Propeller Made for ..... 251
Balloon Pilots, Army, Training Camp Established for ..... 937
Balloon Race, International, Ends in Doubt. 516
Balloon Stunt, Thrilling, by European Dare Devil ..... 922
Balloon, Toy, Can be Folded Flat or Inflated 776
Balloons, Models of Dirigible, Method of Testing ..... 225
Balloons, Toy, Nonexplosive Gas Now Used for ..... 53
Balls, Golf, Driving Machine Tests ..... 913
Balls, New Golf, Machine for Testing Resiliency of ..... 572
Bamboo Only Essential Material in Chinese Building ..... 897
Band, City, Boy Scouts' Wireless Displaces.. 772
Band Stand, Memorial, for War Veterans of Spillville, Iowa ..... 275
Band, Wireless, in Student Parade ..... 768
Banjo Bridge, Adjustable, and Clothing Guard ..... 691
Banjo Heads, Bracketless, Adjusted with One Key ..... 720
Banjo Strings Made Snappy by Extension Tailpiece ..... 119
Banjos, Nonslipping Tuning Peg for..... 936
Banjos, Nontipping Bridge for ..... 936
Banjos, Peg for Strings of ..... 722
Bank, Dime, in Rear Cover of Savings Book 882
Bank, Neat Calendar Savings, to Encourage Thrift ..... 227
Bank, Toy, Works on Wireless Principle.... 777
Bank Vault, Concrete, Mining Tools Used to Strip ..... 64
Barbed Wire, Fastening to Iron Posts..... 817
Barber Chair, Auto, for Children..... 612
Barges, Twin, with One Deck as Support for Derrick ..... 831
Barley, New Variety of, Has Striking Qualities ..... 113
Barrel—Keg, Tumbler Made from ..... 301
Barrel, Mammoth, Is Refreshment Stand.... 722
Barrel Regulator for Rain Water ..... 638
Barrel, Rolling, on Frame Gives Barrels of Fun ..... 284
Barrels, Mountain of, Burn at Boston Celebration ..... 382
Barrels, Wine, Roman Chariots Made from.. 416
Bars, Iron, How to Twist ..... 128
Bars, Long Metal, Supporting in Speed Lathe 782
Bars, Round, Centering ..... 792
Barter Trade in Germany ..... 32
Basalt, Queer Formation of, Resembles Huge Postpile, by John L. Von Blon..... 54
Base Ball—Wooden Frame for Testing Skill of Pitchers ..... 284
Basin and Channel Dredged in Bahama Islands ..... 112
Basin, Separate Water, for Household Supply 250
Basket, Hanging, How to Line ..... 153
Basket, Sanitary Fruit Display, Also Preserves ..... 80
Basket, Wash Boiler, Removes Clothes Easily 443
Bathhouse, Hot Spring, for Salt Lake City, by George F. Paul ..... 532
Bathhouse, Portable, How to Make..... 160
Bathhouses, Election Booths on Wheels Used as ..... 226
Bathing Beach Fad, Latest, "Sea Horse" Is.. 409
Bathing Beach, Philadelphia's Public, Largest in Country ..... 759
Bathing Beach Tent, Small, as Dressing Room ..... 884
Bathing Beach Water, Piping System to Purify ..... 211
Bathing Cap Ornaments, How to Make..... 653
Bathing Slippers, Rubber, Protects Feet.... 442
Bathing Suit, Nonsinkable, for Timid Swimmers ..... 721
Bathroom Seat Folds into Wall..... 775
Bathroom Stool Contains Shoe Shining Stand 114
Batteries, Dry Cell, Inclosed in Steel Case.. 927

Batteries, Lightweight Storage, Now Made.. 436
Batteries, Simple Hydrometer Quickly Tests 194
Batteries, Storage, Lead Welding Outfit for. 542
Battery Cell Filler Prevents Overflow..... 614
Battery Checking Voltimeter of Handy Design ..... 6
Battery Opener, Electric, Simple and Practical ..... 57
Battery Plugs, Wireless Knobs Made from.. 642
Bayonets, German, Converted into Chopping Machines ..... 122
Beach Dressing Room, Small Tent as..... 884
Beach, Philadelphia's Public, Largest in Country ..... 759
Beadwork, Improved Loom for ..... 795
Bean Industry, Soy, Imports Indicate Growth of ..... 864
Bear, Escaped, Novel Method of Capturing.. 8
Bearings, Clamp Aids in Fitting ..... 462
Bearings, Machine Babbitts in Connecting Rods ..... 103
Beavers Menace Irrigation by Damming Ditches ..... 224
Bed, Flashlight Bracket for ..... 155
Bed, Fresh Air, Has Removable Screens..... 935
Bedouins, Amateur, on the Warpath..... 757
Beds, Brass, Refinishing ..... 796
Bedstead, Clothes Hook for ..... 315
Bee Families, Attractive Bungalows to House 344
Bees, Swarm of, Searchlights Used to Rout.. 118
Beeswax, How to Bleach ..... 803
Beet Harvester, Sugar, Automatic ..... 543
Beet Waste Utilized to Increase Sugar Yield 748
Bell Annunciators for Group Machine Operators ..... 456
Bell, Dinner, Birds Answer at State Game Farm ..... 609
Bell, Door, Connecting to Lighting System.. 653
Bell—Gong, Simple Farm, How to Make.... 963
Belt Buckle for Easy Adjustments..... 771
Belt, Coal Mine, to Carry Output through Long Tunnel ..... 544
Belt Ends, Clamp for Squaring ..... 460
Belt Sander, Motor Driven, Novel ..... 385
Belt Shifter, Safety Stop Automatically Acts as ..... 239
Belt, Swimming, Gives Free Arm Action.... 279
Belts, Fan, Rawhide Used in..... 117
Belts, Leather, Dressing and Cleaning..... 784
Belts Prevented from Slipping by Special Covering ..... 283
Belts, Sewing Machine, Keeping from Slipping ..... 967
Belts, Tight, How to Put On..... 616
Bench Furnace, Gas Fired, Has Many Uses.. 527
Bench Grinder, Homemade Utility ..... 466
Bench Measuring Machine of Extreme Precision ..... 847
Bench, Movable, for Repair Pit..... 306
Bench Saw, High Speed, Cuts Hard or Soft Metal ..... 700
Bench, Tilting Arbor Saw, Direct Motor Driven ..... 92
Berry Preserving Process Saves Crop..... 379
Bib, Child's, Made of White Rubber with Sleeves ..... 606
Bible, Rare Copy of, Donated to American Library ..... 744
Bicycle, Early Day, Ridden on Trip to Chicago ..... 881
Bicycle Handlebar, New Adjustable ..... 545
Bicycle Handlebars, Rooster Rides on..... 613
Bicycle, Large Pipe On, Advertises Shop... 724
Bicycle Motor Wheel as Home Shop Power Plant ..... 799
Bicycle, Odd Appearing, Man Makes to Carry Family ..... 695
Bicycle, Toy, Has Sidecar for Extra Passenger ..... 943
Binder, Mammoth Loose Leaf, Largest Ever Built ..... 79
Binder, New Grain, Cuts 35 Acres Per Day.. 739
Biplane, Army, Wins Air Race with Record Speed ..... 853
Biplane, Six Passenger, First American Constructed ..... 665
Birch Wood Used as Fuel in Sweden..... 694
Bird, Humming, in Nest with Young..... 776
Bird Mansions, Artistic and Elaborate..... 400
Bird, Mocking, Imitates Clucking Hen..... 611
Bird or Flower Poem, Prize Offered for..... 327
Birdcage Seed and Water Holders for Nine Day Supply ..... 444
Birdhouses, Dishpan as Cat Guard for..... 646
Birds Answer Dinner Bell at State Game Farm ..... 609
Birds—Eagle Family, Motion Picture Camera Used to "Shoot" ..... 168
Birds, Mine Rescue, Oxygen Cage for..... 383
Birds—Sea Gulls Drop Clams on Roof to Break the Shells ..... 691
Birds, Society to Aid Children in Study of.. 357
Biscuits Made from Wheat Cut, Threshed, Ground, and Cooked at One Time..... 739
Bit, Detachable Rock Drill, Indicates Economy ..... 600
Bit, Oil Well Drill, Drills Hole and Takes a Core ..... 280
Bit, Soldering, Double Point ..... 289
Bits, Cutting Off Tool, Improving..... 632
Blackboard, School Wardrobe Changes into. 601
Blacksmiths, Tong Rack for..... 955
Blanket Represents Strange Tribal Legend.. 261
Blind, New Type for, Permits Them to Correspond ..... 520
Block, Pounding, Strap Handle for..... 633
Block, Precision Testing ..... 454
Block, Wireless, for Using Several Phones.. 816
Blockhouse, Old, on River "Point," Penn... 602
Blocks, Adjustable "V," from Pipe Fittings 781
Blocks, Concrete, Contain Electric Connections for Temporary Lighting ..... 439
Blocks, Concrete, for Protecting Walks and Lawns ..... 161
Blocks for Auto Jacks ..... 487
Blood, Simple Tests for Determining Quantity of Carbon Monoxide in..... 242
Blow Out Patches, Rawhide Used in..... 117
Blow Out Plugs and Patches for Tires..... 939
Blow Out Shoe, Long Lived..... 647
Blower Fan, Electric, Used to Cure Hay .... 728
Blower Mechanism, Positive, Basis of New Gas Meter ..... 567
Blowtorch, Improved, Uses Kerosene or Gasoline ..... 573
Blowtorch, Soldering Flux Container Handy on ..... 135
Blueprint Paper, Old, Using..... 783
Blueprinting without a Frame..... 472
Blueprints, Overexposed, Lightening....470, 627
Blueprints, Quick Method of Making..... 624
Blueprints, Timing Tests for..... 142
Board, Safety Toe, for Freight Car Truckmen ..... 50
Boardwalk Pageant, Colorful, to be Staged at Atlantic City ..... 491
Boat, Air Propelled Ice, with Motor Bus Body ..... 271
Boat—Canoe, Mounting a Rowboat Motor in 317
Boat Collision, Fatal Head-On, on Columbia River ..... 207
Boat—Cutter, Coast Guard, Passes between Two Icebergs ..... 76
Boat—Dance Pavilion and Palm Garden, Floating ..... 337
Boat—Dredge Clears River Channel and Builds Levees ..... 749
Boat Engine, Attaching Generator to..... 155
Boat—Ferry, Passenger and Auto, on Detroit River ..... 531
Boat—Ferryboat, Oil Electric, on Hudson River ..... 5
Boat—Flagship, British, Model of, on American Auto Truck ..... 423
Boat Hoist, Simple, How to Make..... 148
Boat—Hospital, Floating, Treats Foot Troubles ..... 392
Boat—Houseboat for Cotton Mill Employes. 881
Boat Hulk Converted into Modern Coal Handling Plant for Bunkering Steamships 48
Boat, Japanese Pine Tree Trained to Form. 28
Boat—Junk, Chinese, Adventurer Crosses Pacific in ..... 822
Boat—Launch, Commodious River, of Famous Surgeon ..... 352
Boat—"Leviathan," Model of, Passes Shipping Board ..... 591
Boat—Lifeboat, Large Motor, Has Cabin Accommodations ..... 62
Boat—Lifeboat, Motor, with Hospital Equipment ..... 191
Boat—Liner, Large, Converted to Oil Fuel Burning ..... 189
Boat, Lumber, Has Cargo Strewn on Beach by Storm ..... 732

Boat "Lusitania" to Have Memorial Float over Its Grave ..... 202
Boat—Motorboat Made from Boxes Wins Prize ..... 285
Boat—Motorboat, Nonsinkable, Has Special Compartments ..... 106
Boat Oars, Keeping in Rowlocks ..... 481
Boat—Oil Tanker, Wrecked, Salvaged by Docking It Sideways ..... 555
Boat "Olympic" Makes New Speed Record ..... 365
Boat, Open Drawbridge Wrecked by ..... 355
Boat Propellers, Cast Iron, Made Smooth by Enamel Coating ..... 890
Boat—Pushboat, How to Build ..... 635
Boat "Quest," Ill Fated, Returns from Antarctic ..... 912
Boat Race, Pacific Fleet, Closely Run ..... 709
Boat, Required Time for, to Find Its Position by Wireless Telegraphy ..... 423
Boat—Rowboat, Collapsible, Made to Carry Three ..... 582
Boat—Rowboat, Open, Cruise of Great Lakes In ..... 550
Boat—Rowboat, Sectional Flat Bottom, How to Make ..... 307
Boat Rudder, Double, New Form of, being Tested in Germany ..... 593
Boat Rudder, Propelling, for Small Crafts ..... 520
Boat—Sailing Bark "Köbenhavn" to Compete with Ocean Steamships ..... 251
Boat—Ship, A Runaway, by H. H. Windsor. 359
Boat—Ship Bulkhead Doors, Fireproof, Made of Mahogany ..... 72
Boat—Ship, Concrete, Wreck of Shows Great Endurance ..... 15
Boat—Ship, Crumpled Bow, Saved from Sinking ..... 505
Boat—Ship, Disabled 9,000 Ton, Towed 2,000 Miles ..... 504
Boat—Ship "Lusitania," Expedition to Salvage ..... 53
Boat—Ship "Majestic" Is World's Largest, by Henry S. White ..... 42
Boat—Ship, Mother, and Brood of Submarine Chasers ..... 38
Boat—Ship, The Cement, by H. H. Windsor. 29
Boat—Ship Tonnage Explained ..... 948
Cargo through ..... 60
Boat—Stern Wheeler, Homemade, Driven by Leg Power ..... 928
Boat—Stern Wheeler, Made for Construction Work ..... 945
Boat, Strong Swimmer Tows, with Seven Passengers ..... 424
Boat—Submarine Salvaged to Sink It, by Edward G. Maxwell ..... 863
Boat—Submarine "S-51" Completes Its Test Successfully ..... 244
Boat, Three Section, Easily Transportable ..... 98
Boat—Water Scooter, Toy, How to Make ..... 651
Boat—"Water Skate," Toy, How to Make ..... 161
Boat Waterline, Drawing True ..... 138
Boat—Yacht, American Model, Wins in International Race ..... 383
Boats—Canoes Made by South Pacific Islanders ..... 81
Boats—Destroyers, Maneuvers of, Necessary for Formation of Smoke Screens ..... 536
Boats, Directional Wireless Waves for Guiding ..... 212
Boats—Ferryboats, Electric Drive, Coming to the Fore ..... 546
Boats—Fireboats, New York, High Pressure Pumps for ..... 903
Boats—Hydrogliders with Surface Propellers ..... 837
Boats in Flooded Town Carry Voters to Polls 51
Boats, Mooring in Tidal Waters ..... 482
Boats—Ocean Liners, Wireless Payments Now Made While Aboard ..... 107
Boats, Scrapping, by Idle Shipyards, by D. R. Lane ..... 740
Boats—Ships, Lookout Direction Indicator for Use on ..... 64
Boats—Ships, Phantom, of the Arctic, by Stratford F. Corbett ..... 346
Boats—Ships, Two 70,000 Ton, Plan to Build ..... 746
Boats, Strange Railroad Carries, from Lake to Sea ..... 55
Boats—Submarines, Two, Added to U. S. Navy ..... 357
Boats, Torpedo, Small Speedy, Navy Acquires ..... 497
Boats, Various Models of, Used by South Sea Islanders ..... 726
Boats—Warships, Six American, to be Given to Poland by New Bill ..... 567
Boats—170 Vessels to be Built in Belgium for Transporting Coal from Ruhr District 10
Boiler Draft Gauge, Multiple ..... 254
Boiler Rack, Wire Wash, Removes Clothes Easily ..... 443
Boiler Scale, Carbon Dioxide Softens ..... 722
Boiler Scale, Feed Water Purifier Precipitates ..... 772
Boiler, Steam, for Model Engines ..... 643
Boiler, Wash, Faucet on, Aids in Emptying. 490
Boilers, Largest Power, Now in Operation ..... 860
Boll Weevil, Cotton, Suction Machine Destroys ..... 193
Bolt Annealing Machine ..... 468
Bolt Clippers, Farm Uses for ..... 306
Bolt, Split "T," How to Make ..... 616
Bolts, Auto Cylinder Head, Replacing ..... 474
Bolts, Bottle Caps Prevent Turning of ..... 788
Bolts, Tongs for Placing ..... 963
Bomb, Monster Demolition, Weighs 4,000 Pounds ..... 919
Bombing Airplane, Largest American, Tried Out by U. S. Army ..... 886
Book — Bible, Rare Copy of, Donated to American Library ..... 744
Book—Directory Edition, Special, for City's 300th Year ..... 824
Book Ends Made from Angle Iron ..... 982
Book—Novel, Prize Offered for, by American Author ..... 327
Book of Self Revelation, Reward Offered for 819
Book, Sales, Foreign Trade Committee Publish ..... 272
Book, Savings, Dime Bank in Rear Cover of. 882
Book—Telephone Directory Hanger, Simple and Convenient ..... 749
Book Trimmer, Improved Continuous ..... 508
Books, Leather Bound, Care of ..... 810
Bookshelf Accessory Holds Books in Place ..... 816
Bookstore Recreation Spot in Pasadena, Calif. ..... 110
Booster, New Gas, Advantages of, in Large Plants ..... 755
Booths, Election, on Wheels Used as Bathhouses ..... 226
Booths, Remote Control, for Arlington Wireless Station ..... 417
Boots, Wading, Swimming in ..... 485
Boring Gauge, Simple ..... 288
Bottle Cap Prevents Bolt from Turning ..... 788
Bottle Corks, Vacuum, Repair for ..... 478
Bottle Crowner, Improved, Operated by Hand ..... 538
Bottle, Hot Water, Instant Heat Chemical Bags as ..... 94
Bottles, Luminous Poison Indicator for ..... 608
Bottles, Shaker Top for ..... 638
Boulevard, Dredging Outfit Cuts Canal Across ..... 435
Boundary Mark Sign at Salem, Mass ..... 930
Bouquet—Corsage Shield, Feather, Is Colorful Novelty ..... 66
Bowl, Huge Wash, Automobile Running Gears Washed in ..... 178
Bowlders, Dragging with Tractor ..... 797
Bowls, Inverted Light, Insects Kept from ..... 802
Box Car Converted into Handy Classroom ..... 909
Box, Cylindrical Lunch, Used as Extra Auto Seat ..... 608
Box, Dark, for Photographers ..... 146
Box, Feed, Prevents Stock from Upsetting ..... 976
Box, Folding Lunch, and Table ..... 476
Box for Shingles Reduces Loss in Shipping. 56
Box Holds Discarded Magazines to be Given to Poor ..... 766
Box, Mail, Which Is Always Locked ..... 310
Box, Milk, Lamps Prevent Freezing in ..... 215
Box, Novel Rubbish, for Park ..... 474
Box, Portable Feed, for Horses ..... 483
Box, Ripe Fig, for Shipping without Injury 108
Box, Sanitary Milk, for Placing on Wall of Porch ..... 114
Box Testing Machine, New, at Federal Laboratory ..... 492
Box Toolholder, Accurate ..... 141
Boxes — Cartons, Blue Egg, Makes Eggs Whiter ..... 257

Boxes, Fiber, Strength of..... 128
Boxes, Heavy, Skid for Handling..... 954
Boxes, Locomotive Sand, Improvement in... 117
Boxes, Magazine, on Park Trees for Use of Public ..... 766
Boxes, Shipping, Machine Quickly Forms and Prints ..... 252
Boxes, Snug Packing in, Tumble Drum Shows Advantage of..... 194
Boxes, Stuffing, Metallic Packing for Use in 96
Boy Day, Japanese, Flying Fish Signalize, by A. G. Clutterbuck..... 414
Boy Scout Executive Presented with Gold Eagle Badge ..... 942
Boy Scout Hikes from Atlantic to Pacific.... 121
Boy Scouts, Native African..... 449
Boy Scouts' Wireless, City Band Displaced by ..... 772
Boy's Voice Outranges Piano Keyboard.... 194
Brace for Doubletrees..... 628
Bracket, Flashlight, for Bed..... 155
Brads, Small, Device for Starting..... 302
Brake Bands, Relining Fixture for..... 948
Brakes, Automobile, Tool for Adjusting..... 309
Bran, Kaoliang, Utilized in Dye Manufacture ..... 97
Brass Beds and Fixtures, Refinishing..... 796
Brass, Coppering for Laying Out..... 624
Brass, Hardened, Drawing Temper from... 948
Brass, How to Make Black..... 484
Bread Slicer, Automatic, Cuts Loaves Rapidly ..... 884
Breakfast Nook Table, Improved..... 146
Breathing Pipe, Sanitary, on Tractor..... 403
Brick and Tile, Dipping Tank for..... 787
Bridge, Adjustable Banjo, and Clothing Guard ..... 691
Bridge, Aerial, Duluth Tunnel to Replace.. 733
Bridge Arches, Concrete, Built by New Method ..... 549
Bridge, Artistic, for San Francisco Viaduct. 603
Bridge, Artistic Tea Garden, in California.. 438
Bridge, Bascule, Controlled by Moving Counterweight ..... 880
Bridge "Boosting"—A New Job for Dynamite, by H. S. Arbo..... 11
Bridge Building, Alaskan, Tests Engineering Skill, by George F. Paul..... 67
Bridge Building Derrick Mounted on Twin Barges with One Deck..... 831
Bridge, Cantilever, to Span Hugh River in India ..... 507
Bridge—Causeway, Galveston's Great, Formally Dedicated ..... 213
Bridge, Columbia River, Eliminates Last Ferry on Yellowstone Trail..... 686
Bridge, Concrete, Completed Over Housatonic River ..... 185
Bridge, Concrete, Dedicated to Service Men. 525
Bridge Dedication Ceremonies, Columbia River, Indian Participates in..... 509
Bridge — Drawbridge, Open, Wrecked by Steamer ..... 355
Bridge, Long Span Concrete Steel, at Oregon City ..... 97
Bridge, New Brooklyn, Planned as Cables Shift ..... 528
Bridge, New, Increases Tone of Stringed Instruments ..... 281
Bridge, New, to be Built Across Thames River, London ..... 736
Bridge, Nontipping, for Banjos..... 936
Bridge Painted Checkerboard as Warning... 438
Bridge, Pedestrians Suspension, Over Waimea River, Hawaiian Islands..... 110
Bridge, Reinforcement for, Assembled on Barges ..... 710
Bridge Tide Gauge Helpful to Navigators... 746
Bridge Timbers, Long, Ingenious Rig for Hauling ..... 582
Bridge to Memorialize Historic "Delaware Crossing" ..... 551
Bridge—Viaduct Piers, Concrete, Replaced by Unusual Methods..... 757
Bridge, Wheatstone, for Coil Winding..... 812
Bridge Work, Steel Traveler on Barge Aids 403
Bridges, Small Suspension, Built in New Zealand ..... 589
Brief Case, File for..... 474
Brinkman, Walter:
Village, Model, Mariemont to be..... 893
Briquettes, Carbon, as Fuel Demonstrated in Outdoor Fireplaces..... 208
Briquetting Plant, Coal, in Western China.. 164
Broach, Using a..... 126
Broaching Lubricant, Soda and Water as, for Cast Iron..... 298
Brooder, Chick, Feather Duster as..... 816
Broom Handles Made Tubular Instead of Solid ..... 8
Broom, Metal, Steel Wire Fillers Used in.... 281
Brush and Hanger Combination for Clothes 196
Brush and Scraper Combined for Cleaning Pots and Pans..... 278
Brush Hook Made from Old Saw..... 818
Brush Machine, Glasses Quickly Cleaned with ..... 228
Brush, Metal, Steel Wire Fillers Used in... 281
Brush, Pocket, and Comb Combined..... 115
Brush, Renewable Bristle, for Hair Folds Like Book ..... 934
Brush, Tooth, Made of Rubber..... 115
Brush, Window, Has Compartment for Water 771
Brushes, Generator, Small Improved.....787
Buckle, Belt, for Easy Adjustments..... 771
Buds, Seedless Apple Tree, to Propagate New Variety ..... 103
Bug Catcher Lures Insects with Bright Lights ..... 206
Buggies for Carrying Concrete Have Pneumatic Tires ..... 846
Buggy, Collapsible Baby, for Home or Auto Use ..... 934
Bugs, Lightning, "Flash" on Photographic Plate ..... 540
Building, Academy of Science, to be Erected at Washington, D. C..... 392
Building — Bathhouse, Philadelphia's Public, Largest in Country..... 759
Building—Bungalow or Garage at Owner's Option ..... 117
Building—Canal Terminal, World's Largest, by Gordon P. Gleason..... 264
Building—Capitol, Nebraska State, Work begun on ..... 6
Building, Chinese, Bamboo Only Essential Material in ..... 897
Building—Church, Beautiful, Built at Small Cost ..... 516
Building—Clubhouse on Susquehanna River Built on Abutment of Old Disused Canal. 275
Building Columns, Darkened, Illuminated by Strong Lights ..... 848
Building, Concrete, Cement from Returned Bags Builds ..... 716
Building, Concrete, Gives Touch of Fairyland ..... 926
Building. Design, Newspaper Offers Prizes for ..... 327
Building Dimensions, Reproducing without Plans ..... 141
Building, Exhibition, Given Canada by Lucerne, Switzerland, to Promote Trade Relations ..... 226
Building — Gymnasium, New, Completed at Bloomington, Ill. ..... 930
Building—Hospital, New York's $10,000,000, by Charles Martel Niles..... 421
Building—Hotel Moved to New Site, 120 Feet Distant ..... 547
Building — Laboratory, Finest and Best Equipped, being Erected at Minneapolis.. 398
Building, Largest School, on Single Floor Plan ..... 243
Building, Lincoln Memorial, Dedicated..... 2
Building Material:
Concrete Lumber, Two Types of, by Frank B. Howe..... 100
Concrete Sheets Made by New Process, by Allen P. Child..... 564
Lumber, Speed Kiln Drying Process Improves ..... 548
Roofing Materials Tested for Heat Radiation ..... 717
Roofing, Rolls of, Preventing from Cracking ..... 620
Roofing, Strong Corrugated, Made of Asbestos and Cement..... 71
Shingle Package Reduces Loss in Shipping ..... 56
Shingles, Composition, Serves as Tile or Flat Pattern ..... 743
Shingles, Slate, Nail Holes for..... 221
Wallboard Fasteners, Self Clinching..... 63
Building — Memorial, George Washington Masonic National, by R. C. Folger..... 518

Building — Memorial Hall to be Built at Bloomington, Ill. ..... 277
Building — Museum, National Engineering, Planned at Washington..... 716
Building, Office, to be Wired for Wireless.. 492
Building, Queer, Sea Furnishes Material for 222
Building—Shrine, Miniature Model of, Made by Hindu Monks..... 99
Building, State Capitol, Carved in Wood... 46
Building—Temple, Masonic Lodge, Built by Its Members ..... 178
Building—Theater, Vancouver, Beats High Cost of Ground..... 676
Building, Two Story, on Stilts Has Elevated Basement..... 76
Building, Unofficial American, to be Erected at Brazilian Centennial Exposition in Rio de Janeiro ..... 112
Buildings, Adobe, Long in Ruins Remodeled 753
Buildings, Brazilian Exposition, at Rio De Janeiro ..... 698
Buildings, Height Limit of, Increased in London ..... 589
Buildings, Two, Collapse with No Injuries.. 876
Bulb, Electric, Is Largest in World, by Bernard G. Priestley..... 841
Bulb Filaments, Electric, How to Repair... 161
Bulbs, Headlight, Preventing Vibration of.. 316
Bulbs, Small Electric Light, Removing..... 489
Bulkhead Doors, Fireproof, Made of Mahogany ..... 72
Bullock Carts in Colombo, Ceylon, Fitted with Rubber Tires..... 927
Bumper, Self-Acting Auto, Also "Kills" Engine ..... 899
Bumpers, Auto Safety, Stop Car Automatically ..... 555
Bungalow, Artistic, for Pigeons..... 407
Bungalow, Little, Won by Girl for Prize Winning Essay ..... 285
Bungalow or Garage at Owner's Option..... 117
Bungalows, Attractive, to House Bee Families ..... 344
Burglar Alarm, Auto, Homemade..... 476
Burglar Alarm Connected to Lighting Circuit ..... 322
Burglar Alarm, Portable, Simple and Effective ..... 122
Burner, Gas, Cooks and Heats Water at Same Time ..... 34
Burner, Homemade Gas, for Heating Furnaces ..... 780
Burners, Gas, Convertible Fixture for..... 330
Burners, Gas, Rules for Testing..... 407
Bus, Automobile, for Traveling Show Players ..... 33
Bus, Automobile, to be Used by Chicago Elevated Railway ..... 930
Bus, Motor, Large Capacity, Has Detachable Body ..... 391
Bus, Upper Deck of, Has Unique Top Piece. 550
Bushing, Master, in Deep Oil Well Recovered by "Human Gopher," by Fred A. Herr 329
Bushing, Self-Locking Drill, for Slot Jig.... 623
Bushings, Auxiliary, for Toolmaker's Buttons ..... 290
Bushings, Oversize, Shrinking..... 126
Bushings, Removing from Blind Holes..... 781
Bushings, Solid, Taking Up Play in..... 135
Bushings, Worn Auto Spring, Replacing.... 146
Business Code, Best 50-Word, Prizes Offered for ..... 655
Busses, Large Numbers on, Serve Novel Purpose ..... 909
Busses, Motor, Equipped with Wireless.... 169
Busses, Motor, Shower Bath for..... 430
Butter, Fish, Displaces Cow's, by Francis Dickie ..... 433
Buttons, Toolmaker's, Auxiliary Bushings for ..... 290
Buzzer, High Tone Wireless..... 654

Cab, Attractive Hansom, American Auto Makes ..... 590
Cabinet, Compact Kitchen, for Small Space. 443
Cabinet Holds Paper and Carbon Sheets.... 373
Cabinet, Laundry, Homemade..... 484
Cabinet, Music Roll, Automatic..... 496
Cabinet, Pantry, Ventilated Sanitary..... 606
Cabinet, Phonograph, Made from Hollowed Log ..... 500
Cable, British Leader, from Portsmouth Used for First Time..... 565
Cable, Submarine, Unusual Method of Laying ..... 382
Cable, Transmission, Spectacular Repair Task of ..... 723
Cables, Steel, Molded in Concrete being Tested for Girders..... 192
Cables, Wire, Tool Holds and Cuts Easily... 408
Cableway, Mont Blanc, Resume Work on... 383
Café Wall, Telephone Camouflaged in..... 99
Cage, Oxygen, for Mine Rescue Birds..... 383
Cage, Zoo Monkey, Has Hospital and Modern Conveniences ..... 943
Caisson, Deleware River Bridge, Launching 75
Cake Baker, Glass, with Hole in Center.... 443
Cake, Mammoth, Made by Lane School..... 448
Calculator and Pencil Case Combined..... 613
Calculator, Demurrage, Used like Sliderule.. 904
Calendar Savings Bank, Neat, to Encourage Thrift ..... 227
Caliper Attachment for Scale..... 787
Caliper Gauge, Micrometer, for Inspectors.. 53
Caliper Leg, Auxiliary..... 128
Camels and Other Modes of Travel in Central Australia ..... 552
Camera, Aerial, Efficient High Speed..... 36
Camera, Cork In, Prevents Double Exposures 808
Camera, Folding, Photographing Small Articles with ..... 485
Camera, Hand, for Snapshots or Motion Pictures ..... 350
Camera, Motion Picture, How to Make..... 969
Camera Shutter, Mousetrap for Tripping.... 967
Camera, Small Foreign Made, Possesses Ultra Speed ..... 868
Camera Takes 92,000 Pictures Per Second, by A. N. Mirzaoff..... 541
Camera Tripod Head, Motion Picture, Tilting ..... 18
Cameras, Two New Airplane, Developed by Experts ..... 23
Camp and Recreation Sites Given State of Michigan ..... 705
Camp Fire Stake, Metal, Has Three Adjustable Racks ..... 769
Camp Grounds, National, "Recreation Engineer" for ..... 663
Camp Site Incinerator, Homemade..... 809
Camp Sites, Municipal, for Tourists Along Lincoln Highway ..... 182
Camp Stove Has Detachable Oven and Perforated Bottom Plate for Embers..... 607
Camp, Training, for Army Balloon Pilots Established ..... 937
Campaign, Extensive Safety, to Reduce Injuries ..... 353
Camping, Auto Baggage Trailer for..... 63
Camping, Auto Trailer for..... 714
Camping, Mirrior Made Handy for..... 317
Camping Outfit, Compact Collapsible..... 241
Camping Stool, Light Collapsible..... 445
Camping Truck Is House on Wheels..... 188
Can Covers, Tight, How to Loosen..... 472
Can, Gasoline and Oil, for Garage Service... 62
Can, Oil Filling, for Auto Engines..... 633
Can Receiver, Garbage, Underground..... 787
Can, Trash, Easily Dumped..... 947
Canal, Big Ship, U. S. to Have, by Robert Morgan ..... 387
Canal, Dredging Outfit Cuts Across Boulevard ..... 435
Canal, Irrigation, Débris Remover for..... 394
Canal, Panama, Widening at Gaillard Cut.. 738
Canal Terminal, World's Largest, by Gordon P. Gleason..... 264
Candles, Simple Method of Making..... 981
Candy, New Kind of, Made from Unripe Persimmons ..... 892
Cane Industry, Sugar, Improved Process Devised in ..... 206
Cane Mill, Primitive Sugar, Made of Wood.. 108
Cane Mill, Small Sugar, Large Water Wheel Drives ..... 65
Cane or Violin Interchangeable at Will.... 202
Cane, Sorghum, Skid for Hauling..... 953
Cannon, Old Time, Used as Queer Fog Signal ..... 447
Canoe, Mounting a Rowboat Motor in..... 317
Canoes Made by South Pacific Islanders..... 81
Cantons, Swiss, Hold Elections in Open Air. 166
Canvas Wheels, Compressed, for Cars or Pulleys ..... 916
Cap, Slotted Fruit Jar, Aids in Opening..... 443
Capitol Building, State, Carved in Wood.... 46
Capitol, Nebraska State, Work Begun on.... 6

Caps, Device for, Prevents Sagging in Front 891
Caps, Fruit Jar, How to Loosen 472
Car, New Play, Has Clever Drive 353
Caravansary, Motorists', Is New Industry, by Lawrence Wm. Pedrose 523
Carbon Briquettes as Fuel Demonstrated in Outdoor Fireplaces 208
Carbon Dioxide, Softens Boiler Scale 722
Carbon Grinding Balls, High, Give Good Service 330
Carbon Monoxide in Blood, Simple Test for Determining Quantity of 242
Carburetor Dust Trap, Air Cleansing, for Autos 379
Carburetor Heater Vaporizes Heavy Particles of Gasoline 773
Carburetor Needle Valves, Repairing 638
Card Holder for One Armed Players 442
Card Tricks, Two Effective 813
Cardboard Lamp, Ornamental, Can be Folded Flat 210
Cards, Identification, Protecting 312
Cards, Greeting, How to Make 965
Cards, Souvenir, Small Mail Pouch for Mailing 775
Cargo Weighing Scale Works in Accordance with Ship's Draft 60
Carnival, Roller Skating, Held on Busy Street 228
Carnotite Ore Ruins Photographic Films 404
Carpenters, Tool Carrying Attachment for 512
Carpets, How to Hang on the Clothesline 322
Carriage, Baby, Gasoline Motor Driven 215
Carriage, Collapsible Baby, for Home or Auto Use 934
Carriage, Ice Hoisting, with Automatic Action 248
Carrier, Spare Tire, Lifts Heavy Metal Wheels 86
Carrier, Suitcase, and Auto Step Plate Combined 415
Cartons, Blue Egg, Makes Eggs Whiter 257
Cartridges, Broken, Method of Extracting 161
Carts for Carrying Concrete Have Pneumatic Tires 846
Carts, Native Bullock, Fitted with Rubber Tires in Colombo, Ceylon 927
Case, Brief, File for 474
Case for Small Drills 469
Case, Identification Card 312
Case, Pencil, and Calculator Combined 613
Case, Snug Packing, Has Advantages 194
Cases, Shipping, Machine Quickly Forms and Prints 252
Casket, Elaborate, Provided for Japanese Dignitary 376
Cast Iron Broaching, Soda and Water as Lubricant for 298
Casting, Huge, Shipped Hanging between two Cars 409
Casting, Preheating before Welding 141
Casting without Rolling the Flask 125
Castings, Gray Iron, Cleaning Scale from 455
Cat Guard, Dishpan as, for Birdhouses 646
Cat Tail Growths, Hogs Thrive on 4
Cat, Toy, Has Luminous Eyes that Roll 943
Catapult, Toy, How to Make 811
Catcher for Japan Clover Seed 290
Cathedral Souvenirs, Rheim, Doughboys Urged to Return 491
Cattle Breeding, Coöperative, in North Dakota, by Allen P. Child 718
Cattle, Drinking Water for, Obtained from Dew 90
Cattle, Young, Automatic Weaning Device for 557
Causeway, Galveston's Great, Formally Dedicated 213
Cavern, Mammoth Mexican, Fantastic Rock Formation in 854
Cedar Stump Is Reservoir for Water System 402
Celebration, Beautiful Peace, Japanese Hold 401
Celebration, Boston, Mountain of Barrels Burn at 382
Celebration Buildings, Brazilian, at Ric De Janeiro 698
Celebration, "Days of '49" 367
Celluloid, Marking with Type Slug 292
Cement and Asbestos Roofing Is Strong and Corrugated 71
Cement Bags, Empty, Compressed Air Ram for Baling 827
Cement Kilns, Rotary, Cleaned with Shotgun 737
Cement, Returned Bag, Builds Concrete Shed 716
Cement Sacks, Amount of Cloth Used for 940
Cement Ship, The, by H. H. Windsor 29
Cement Successfully Used as Fire Extinguisher 444
Cemetery, Ancient, and Oil Wells Share Same Ground 109
Censor Experts to View Industrial Films 109
Center Base, Pipe, Boring Out in Lead Chuck 454
Center, Expansion Relieving, for Lathe Headstocks 282
Centers, Adjustable, for Laying Out 292
Centers, Miller Index, Grinding 140
Centrifugal Machine Makes Coffee and Bottles It 50
Chain Bag, Handy Tire, for Autos 106
Chain for Hanging Clothes in Closet 642
Chain, Steel, Stretching of, Makes It Rigid as Bar 546
Chains, Auto Tire, Aid for Applying 645
Chains, Vacuum Cup, for Auto Tires 53
Chair, Bed, and Writing Desk Combination with Swinging Arm 115
Chair, Divided Organist, Makes Playing Easier 66
Chair, Folding Metal, Is Strong and Neat 273
Chair, Invalid Walking, Better Than Crutches 248
Chair, Rolling, with Crutch for Invalids 5
Chairs and Rockers, Folding, Comfortable and Cool 534
Chairs, Bent Wood Folding, of Extreme Compactness 543
Chamfer Grinding Fixture for Thread Chasers 534
Chamois Skin, How to Clean 321
Channel and Basin Dredged in Bahama Islands 112
Channel, River, Remodeling, by Ivan E. Houk 230
Channel Tunnel, English, Boring of, to See New Methods 402
Chariots, Roman, Made from Wine Barrels 416
Chart, Golf, Is Primer for Beginners 545
Check Book Stub Holder Leaves Both Hands Free 61
Checkerboard Painted Bridge as Warning 438
Checkers, Lawn, Squares of Grass Used in 250
Cheese, Swiss, X-Ray Machine for Examining 738
Chemical Container, New, Is Boon to Industry 594
Chemical Elements, Artificial Transmutation of, by Rogers D. Rusk 917
Chemical Heat Bag for Many Uses 94
Cherry Picker, Effective Homemade 474
Chest for Storing Tires 967
Chestnut Trees, Infected, Durability of, as Timber 752
Chicken Brooder, Feather Duster as 816
Chicken—Rooster Rides on Handlebars of Bicycle 613
Chickens, Self-Feeder for 647
Chiefs of Colonial Troops Visit French Capitol 561
Child, Allen P.:
Cattle Breeding, Coöperative, in North Dakota 718
Concrete Made in Sheets by New Process 564
Hydroelectric Plant, Picturesque, in France 923
Child Portraiture, New Captivating Method for 450
Child, Small, Tows Boatload of Men with Hands Tied 777
Children "Checked" for Vacation Camp, New Jersey 767
Children, Society Aids, in Study of Birds 357
Children's Picture Pages
120, 284, 448, 612, 776, 942
Child's Play Car Has Clever Drive 353
Chimney, Brick, Moved to New Site Eight Feet Distant 720
Chimney, Lightning Specially Attracted by 706
Chimney, Spiral, to Resist Wind Stresses 561
China Closet, Goblet Holder for, Saves Space 162
Chip Cleaner for Small Wood Turning Lathe 962
Chisel, Chipping, for Tough Steel 465
Chisel, Long Handled, for Tree Pruning 94
Chisel, Self Contained, and Hammer 127
Chocolate Confections, Recipes for, Prizes Offered for 983

Chopping Dish, Glass, for Onions Protects Eyes ..... 442
Chopping Machines, German Bayonets Converted into ..... 122
Christmas, Earl:
Iron, Recovering from Low Grade Ore.... 713
Chrome Plating Possible by New Process... 611
Chuck, Nonslip Drill, Requires No Key..... 912
Chuck, Sectional Wheel, for Face Grinding. 262
Chucking Narrow Work..... 630
Church, Automobile Body Built to Imitate.. 709
Church, Beautiful, Built at Small Cost..... 516
Church, Brick, Built Around Frame Structure ..... 597
Church, Farthest North, Completed..... 122
Church, Revolving Cross on, at Wilkinsburg, Penn. ..... 767
Church Window, Ornamental, Is War Memorial ..... 248
Cinder Concrete, Tapping..... 625
Citrus Trees, Root Fungus Treatment to Save ..... 416
City Map, Aerial, to be Made of New Orleans ..... 415
City — Philadelphia may become Largest Flour Port ..... 499
City Site and Buildings Moved Two Miles... 556
City, University, Planned in Paris..... 246
Civic Data, United States and Europe to Exchange ..... 344
Civic Features.....110, 274, 438, 602, 766, 930
Civic Improvement, Chicago's Program of, by Cleveland Gaines ..... 19
Civil Service:
Examinations to Fill Various Vacancies and Positions.....164, 327, 491, 819
Clamp, Bearings Fitted with..... 462
Clamp, Double Welding Rod..... 136
Clamp, Flooring, Homemade..... 631
Clamp for Squaring Ends of Belts..... 460
Clamp, Garden Hose, Replaces Reel..... 736
Clamp, Novel Planer..... 299
Clamp, Picture Frame, How to Make..... 981
Clamp, Planer, for Awkward Pieces..... 125
Clamp, Spring, for Acetylene Welding..... 796
Clamp, Universal Hose..... 487
Clamps, Magneto Magnets Used as..... 634
Clams, Sea Gulls Drop on Roof to Open..... 691
Clark, Florence L.:
Horse Breaking Still a Big Business..... 249
Clay Pipe, Bituminous, Using for Drainage and Sewerage ..... 408
Clay Used for De-Inking Old Newspapers for Printing, by Fred L. Holmes..... 685
Cleaner, Handy, for the Garage..... 142
Clematis Trained to Reproduce American Flag ..... 721
Clip, Swivel, for Pocket Flashlight..... 940
Clippers, Bolt, Farm Uses for..... 306
Clock Alarm, Electric, Kills Man by Excessive Voltage ..... 96
Clock Case Designs, Prizes Offered for..... 819
Clock Dial Tells Time Everywhere at Any Time ..... 176
Clock, Electric Alarm, Switches on Lights.. 114
Clock Mounted on Wireless Receiving Set... 611
Clock with Decimal Face for Figuring Payrolls ..... 904
Clod Crusher and Leveler Operates with Harrow ..... 717
Closet Concealed by Open Door..... 640
Cloth, Amount of, Used for Cement Bags... 940
Cloth, Bursting Point of, Apparatus to Test. 171
Cloth—Linen, Tester for Counting Threads in ..... 831
Cloth, Tracing, Cleaning with Gasoline..... 300
Cloth, Tracing, Stretching Properly..... 288
Cloth, Waterproof, Produced for Roller Shades ..... 283
Cloth, Woolen, German Product Makes Moth Proof ..... 416
Clothes, Cleaning with Vacuum Cleaner..... 155
Clothes Closet, Chain for Hangers in..... 642
Clothes Hanger and Brush Combined..... 196
Clothes Hanger for Closetless Rooms..... 316
Clothes Hangers with Two Hooks and Suspended from Wall Bracket..... 770
Clothes Hook for Bedstead..... 315
Clothes Prop, Collapsible, How to Make..... 978
Clothesline Outfit, Pulley, Motor Driven..... 939
Clothesline Posts, Sweet Pea Trellises Serve as ..... 743
Clothespins, Rake Teeth Made from..... 145
Cloudbursts, Two, in Week at Syracuse..... 380
Clover Seed Catcher, Japan..... 290
Club Entrance Sign, Inlaid Glass, Is Artistic 428
Clubhouse, Boy Size, Built in Tree..... 449
Clubhouse on Susquehanna River Built on Abutment of Old Disused Canal..... 275
Clubs, Golf, How to Identify..... 817
Clubs, Steel Golf, Allowed by Western Association ..... 447
Clutch Pulley, Jaw, How to Make..... 949
Clutch Yoke, Tractor, How to Repair..... 959
Clutterbuck, A. G.:
Boy Day, Japanese, Flying Fish Signalize. 414
Coal Briquetting Plant in Western China... 164
Coal Bunkering Ship, Modern, Made from Ship Hulk ..... 48
Coal Conveyor Protects Lawns..... 243
Coal Meter Records Amount of Fuel Per Hour ..... 895
Coal Mine Belt to Carry Output through Long Tunnel ..... 544
Coal Mine Rescuing Apparatus, Complete,-Coöperative Mining Companies Have..... 399
Coal Mining Film, American, to be Shown Abroad ..... 432
Coal, Polished, Attractive Novelties Made from ..... 410
Coal, Ruhr District, 170 Vessels to be Built in Belgium to Transport..... 10
Coal Seam, Thickest, being Developed in Queensland, Australia ..... 61
Coal Shovel, Locomotive, Automatic Counters on ..... 66
Coal Substitutes, Hard, Caution Users of... 696
Coal Train Wrecked When Deserted by Crew ..... 404
Coconut—Copra, Canoeing over Reefs and Shallows ..... 189
Coconuts, Forty Pound, Take Seven Years to Ripen ..... 888
Code, 50-Word Business, Prizes Offered for. 655
Codes, Eleven Million, Electrical Machine Makes, by H. H. Dunn..... 849
Coffee Made and Bottled by Centrifugal Machine ..... 50
Coffee Percolating Machine for Continuous Service ..... 214
Coffee Percolator, Electric Self-Pouring.... 282
Coffee Pot, China, Has Removable Double Dripping Plates ..... 278
Coffin, Elaborate, Provided for Japanese Dignitary ..... 376
Coil Winding, Wheatstone Bridge for..... 812
Coils, Fan, and Mountings for Wireless..... 498
Coin, Large Swedish Copper, Is Ancient Currency Relic ..... 270
Coins, Holding in Envelope for Mailing..... 311
Coins, Old Gold, Unearthed..... 174
Coke Cooled in Closed Tank by Noncombustible Gas ..... 862
College Near Arctic Circle Opened by Alaska 673
Collision, Fatal Head-On, on Columbia River 207
Colors, Psychology of, Made Subject of Study 891
Colors, Water, Using Old..... 301
Columns, Darkened Building, Illuminated by Strong Lights ..... 848
Columns, Long Steel, Effect Saving in Building ..... 93
Comb, Pocket, and Brush Combined..... 115
Comment and Review, by H. H. Windsor .....29, 209, 359, 701, 865
Commercial Truck, First to Use Wireless Equipment ..... 109
Compressed Air, Blasts of, Replace Loom Shuttle ..... 677
Compressor, Cage Valve Spring..... 782
Compressor, Homemade Air..... 126
Computer Mounted on Clamp Attachable to Desk ..... 895
Concrete, Air Drills and Wedges Used to Break Up ..... 591
Concrete Bank Vault, Mining Tools Used to Strip ..... 64
Concrete Bases, Making for Steel Posts..... 632
Concrete Blocks Contain Electric Connections for Temporary Lighting..... 439
Concrete Blocks for Protecting Walks and Lawns ..... 161
Concrete Bridge Arches Built by New Method ..... 549
Concrete Bridge Completed Over Housatonic River ..... 185
Concrete Bridge Dedicated to Service Men.. 525
Concrete, Buggies for Carrying, Have Pneumatic Tires ..... 846

Concrete, Cables Molded in, being Tested for Girders ..... 192
Concrete, Cinder, Tapping ..... 625
Concrete Dwelling Gives Touch of Fairyland ..... 926
Concrete Garage, Portable, Easy to Assemble ..... 233
Concrete Gateposts, Forms for ..... 789
Concrete, Hotel Fire Demonstrates Worth of ..... 211
Concrete, Lightweight, Has Slag in Place of Gravel ..... 743
Concrete Lumber, Two Types of, by Frank B. Howe ..... 100
Concrete Made in Sheets by New Process, by Allen P. Child ..... 564
Concrete, Making of Maximum Strength ..... 123
Concrete Mixer, Cheap, How to Make ..... 458
Concrete Mixer, Two Wheeled, Easily Portable ..... 558
Concrete Pier Decking Constructed with Safety Openings ..... 60
Concrete Piers Replaced by Unusual Methods ..... 757
Concrete Piles, Big, Divers Work in Cavities of ..... 554
Concrete Pipe, Standardization of Methods Improves ..... 93
Concrete Pipes, New Hydrostatic Apparatus Tests ..... 6
Concrete Reinforcement, Fence Wire as ..... 968
Concrete Road, Concave, of English Design 64
Concrete Road Paving, Moisture Tests Made on ..... 601
Concrete Roads, Preventing from Cracking. 503
Concrete, Sand Containing Organic Matter Investigated for Making ..... 244
Concrete Shed, Cement from Returned Bags Builds ..... 716
Concrete Ship, The, by H. H. Windsor ..... 29
Concrete Ship, Wreck of, Shows Great Endurance ..... 15
Concrete Steel Bridge, Long Span, at Oregon City ..... 97
Concrete Steps, Reinforced, Made in Units .. 896
Concrete Surface Crusher for Road Repair Work ..... 723
Concrete Surface, Smooth, Roughening Machine for ..... 946
Concrete Surfaces, Nonslip, Made by New Method ..... 517
Concrete Tank, Water Tight Pipe Connection for ..... 627
Concrete Tile, How to Make ..... 779
Concrete Walls Destroyed Pneumatically ... 758
Concrete Walls, Hollow, Form for Pouring in Courses ..... 715
Condenser, Automobile Radiator, Made in Form of Still ..... 254
Condenser, Wireless Variable, Neat ..... 356
Condenser, Wireless Variable, of Compact Design ..... 712
Cone Holder, Ice Cream, Made of Pasteboard 558
Conference, Pan Pacific Commercial, to be Held at Honolulu ..... 819
Confession (Poem), by James A. Sanaker .. 492
Connecting Rods for Model Machinery ..... 477
Connecting Rods, Machine Babbitts Bearings in ..... 103
Container, Glue, Shaped like Fountain Pen. 182
Container, New Chemical, Is Boon to Industry ..... 594
Container, Ripe Fig, for Shipping without Injury ..... 108
Contest, Log Rolling ..... 657
Continent, Empty, Autoists Travel 6,000 Miles Across ..... 725
Continental Divide, Long Tunnel to Pierce, by E. C. MacMechen ..... 361
Conveyor, Coal, Protects Lawns ..... 243
Conveyor, Overhead, and Electric Hoist ..... 24
Cooker, Auto Exhaust Pipe, Has Three Large Pans ..... 764
Cooking, Automobile Exhaust Used for ..... 239
Cooling Utensil Cover, Extra Water Heated in ..... 716
Cooling System for Hopper Type Engine .... 456
Coon and Porcupine Meet on Same Tree Branch ..... 612
Copper Coin, Large Swedish, Is Ancient Currency Relic ..... 270
Copper, Extraction of, from Low Grade Ores 435
Copper Horseshoes Help Prevent Forest Fires ..... 430
Copper Ores, Mixed, Cheap Method of Treating ..... 192
Copper Steel Shingle Nails are Rust Resisting ..... 286
Copperplating Brass for Laying Out ..... 624
Copra, Canoeing over Reefs and Shallows ... 189
Corbett, Stratford F.:
Ships, Phantom, of the Arctic ..... 346
Toys, Ingenious, for Christmas Shoppers .. 856
Cord Reel, Two Handled ..... 802
Cork Extractor, Pneumatic, Acts with Air Pressure ..... 79
Cork in Camera Prevents Double Exposures 808
Cork, Shipment of, Burns at Brazilian Port 874
Corks, Vacuum Bottle, Repair for ..... 478
Corn Cleaner Removes Shucks and Silk from Ear ..... 663
Corn Cutter, Homemade ..... 637
Corn, Device for Stringing Rapidly ..... 593
Corn, Ear, Air Blast Outfit Loads into Cars 394
Corn Harvester, Homemade Simple ..... 624
Corn Popper, New Rotary, for Home Use .... 186
Corn, Shoveling Stand for ..... 952
Corn Slicer, Sweet, Has Adjustable Blade ... 934
Corncob Seen as Source of New Industry ... 765
Corncribs, Argentine, Built as Self Feeders for Hogs ..... 736
Cornet Mouthpiece, No-Pressure Attachment to ..... 386
Correspondence Course, Lumber ..... 333
Corsage Shield, Feather, Is Colorful Novelty 66
Cotton Boll Weevil, Suction Machine Destroys ..... 193
Cotton Goods Loom Operated by Wireless ... 892
Cotton Looms, Vacuum Cleaners Used on ... 941
Cotton Mill Employes, Houseboat for ..... 881
Cotton, Record Stalk of, Has 700 Boles ..... 696
Counter, Golf Stroke, Worn on Player's Wrist ..... 524
Counterbore, Reverse, How to Make ..... 958
Countersinking Tool, Setting ..... 290
Couplings, Flexible Shaft, of Simple Construction ..... 736
Cover, Slotted Jar, Aids in Opening ..... 443
Covers, Steel Radiator, to Match Furniture. 447
Covers, Tight Jar, How to Loosen ..... 472
Cow Nurses Orphaned Lambs ..... 776
Cows' Horn Lamp Gives Mellow Glow ..... 604
Cracks, Poultry House, Newspapers for Filling ..... 310
Crane Attached to Tractor Aids Farmer .... 921
Crane, Clamshell, Used to Save Horse's Life 16
Crane, Floating, Unloads Export Locomotives ..... 867
Crane, One Man Electric, for Handling Paper 108
Crankcase Oil Dilution, Automatic Device Removes ..... 99
Crankshafts, Repairing in the Lathe ..... 954
Cream Whipper, Electric, Saves Labor ..... 771
Creek Dried up During Engineering Job .... 349
Crib, Doll, Made like Large One ..... 120
Criminals, Monster Microscope to Aid in Detecting ..... 524
Cripple, Children's Toy Vehicle Used by .... 830
Cripple—Girl on Crutches Can Use Roller Skates ..... 449
Cripples, Prizes Offered for New Occupations for ..... 163
Crop Rotation, Miniature Farm at Fair Shows ..... 513
Cross, Revolving, on Church Steeple at Wilkinsburg, Penn. ..... 767
Crossing Signal, Railway, Has Three Lights 889
Crown Jewels, Russian, Have Fabulous Worth ..... 984
Crowner, Improved Bottle, Operated by Hand ..... 538
Cruise, Great Lakes, in Open Rowboat ..... 550
Cruiser, Loening Air, Makes Fast Trip from Florida ..... 215
Crumb Tray Has Roller for Gathering Crumbs ..... 279
Crumbs as Lure for Fish ..... 637
Crusher, Concrete Surface, for Road Repair Work ..... 723
Crusher, Largest Rock, Holds Full Wagonload ..... 563
Crusher Makes Worn Out Paving Material into Ballast ..... 176
Crusher, Soil, and Leveler Operates with Harrow ..... 717
Crutch, Rolling, with Chair for Invalids ..... 5
"Crying Room," Babies', Built in Theater ... 557
Crystals, Fusible Alloys for Setting ..... 811

Crystals, Wireless, How to Renew..... 966
Cuff Link, Tiny Watch May be Used as..... 606
Cuff Links, Expanding, Permits Sleeve to be Pushed Up..... 443
Cultivator, Homemade Garden..... 475
Cups, Birdcage, Holds Seed and Water for Nine Days..... 444
Curb, Header, Along Street Car Track Protects Pavement, by Harlan H. Edward.... 253
Curling Iron, Electric, Has Swivel Attachment for Cord..... 606
Currycomb Makes Good Fish Scaler..... 160
Curtain Holder, Window, Has Adjustable Clamp..... 114
Curtains, Roller, Waterproof Cloth Produced for..... 283
Curtains, Stretching without a Frame..... 316
Curves, Irregular, Draftsmen's Hint for..... 791
Cushion, Pneumatic Door Jamb, Stops Slamming..... 843
"Cuts," Proofing Easily..... 963
Cutter, Coast Guard, Passes between Two Icebergs..... 76
Cutter for Strawberry Runners..... 155
Cutter, Revolving Toothed, Speed of..... 958
Cutters, Milling, for Use on Wide Surfaces.. 460
Cutters, Milling Machine, When Not Running True..... 631
Cutting Machine, New, for Sheet Metal..... 911
Cutting Off Tools, Improving..... 632
Cutting Tools, Holder for Protecting..... 126
Cyanide Solutions, Acetylene Does not Affect 98
Cylinder Grinder for Lathes and Millers..... 592
Cylinder Grinding Machine Attachable to Lathe..... 44
Cylinder Head Bolts, Auto, Replacing..... 474
Cylinder Head Plugs, Removing..... 464

Dabney, Thomas Ewing:
River, Front, New Orleans Raises..... 369
Dacy, G. H.:
Automobile Testing Apparatus, New, Gives Complete Road Performance Data..... 501
Daisies, Cultivation of, a Paying Enterprise 720
Dam, Irrigation, Novel Method of Building, by O. Johnson..... 762
Dam, Picturesque, in France, by Allen P. Child..... 923
Dam, Splash, and Power Plant in Miniature. 918
Dam, Wilson, by R. C. Folger..... 670
Daming Project of Vast Proportions..... 58
Dams, Asbestos, for Babbitting..... 792
Dams, Rock Filled, Stopping Suck Hole Leakage in..... 86
Dams, Zoological, Serve Dual Purpose..... 380
Dance Pavilion and Palm Garden, Floating. 337
Dancer, Ballet, Performs on Typewriter Keys..... 4
Dandelion Destroyer, Homemade..... 311
Dandelions, How to Kill..... 482
Dark Box for Photographers..... 146
Dark Room Made from Wash Boiler and Coat..... 976
Davenport Has Adjustable Headrest..... 278
Deaths, Accidental, Toll of, Reaches High Mark..... 756
Débris Remover for Irrigation Canal..... 394
Decay, Woodpulp, Reducing by Proper Storage..... 952
Decking, Knockdown, for Shipping Autos... 719
Decorations, Interior House, of Fiji Islanders..... 22
Deers—Reindeers Branded by Notches in the Ears..... 444
"Delaware Crossing," Historic, to be Memorialized..... 551
Demurrage Calculator Used like Sliderule... 904
Dental Machine Casts Gold under Air Pressure..... 281
Dentistry:
Dental Plate Suction Valve for Maintaining Vacuum..... 531
Lip Protector Aids Operator and Patient.. 521
Teeth, Nonskid False, Use Vacuum Cup Idea..... 572
Vulcanizer, New Electric..... 897
Deodorizer and Humidifier in Miniature Fountain..... 822
Deodorizer, Refrigerator, Absorbs all Odors. 115
Depth Gauge Adaptable for Various Liquids 762
Derrick, Twin Barges with One Deck as Support for..... 831
Designs, Colored, Stenciling on Fabrics..... 978
Desk, Movable School, Requires Little Floor Space..... 214
Destroyers, Maneuvers of, Necessary for Formation of Smoke Screens..... 536
Detector, Wireless Crystal, like Vacuum Tube..... 38
Developing Outfit, Compact Pocket Size..... 32
Developing Tray Made of Paraffin..... 974
Dew, Drinking Water for Cattle Obtained from..... 90
Dial, Clock, Tells Time Everywhere at Any Time..... 176
Diamond Setting, Low Melting Point Alloy for..... 664
Diamonds, Resetting in Wheel Dressers..... 127
Dice, Thought Transference with..... 808
Dickie, Francis:
Fish Butter Displaces Cow's..... 433
Indians, Pacific Coast, Fighting to Retain Ancient Rights..... 87
Island, Easter, Proves Mysterious..... 832
Dime Bank in Rear Cover of Savings Book.. 882
Dime, Eric A.:
Gun, Antibandit, in Demonstration..... 41
Dimensions, Building, Reproducing without Plans..... 141
Dinner Plate Rings, Metal, Keeps Food Hot 880
Dip Net, Large, Filipinos Use for Fishing... 71
Dipping Tank for Brick or Tile..... 787
Direction Indicator, Lookout, for Use on Ships..... 64
Directory Edition, Special, for City's 300th Year..... 824
Directory Hanger, Telephone, Simple and Convenient..... 749
Dirigible, Army, Destroyed after First Trip. 852
Dirigible Disasters, by H. H. Windsor..... 865
Dish, Heat Retaining, Uses Vacuum Principle..... 935
Dishpan as Cat Guard for Birdhouses..... 646
Dishwasher Uses Atmospheric Pressure.... 373
Disk Grinder, Portable, Has Graduated Index Table..... 220
Disk Wheels, Auto, Fan Attachment Cools.. 566
Disk Wheels, Steel, Made in Light Weights. 6
Display Stand, Sanitary, Preserves Fruit.... 80
Dissolving Appliance, Drug, Electrically Heated..... 22
Dissolving Slide for Stereopticon..... 288
Ditch Digger, Device Converts Tractor into. 885
Ditch Digging Machine Employs Water.... 23
Diving Platform and Wireless Megaphone Combined..... 343
Dock Improvements Planned for Southampton, England..... 874
Dog Clinic, New Jersey, Opened by Kennel Club..... 574
Dog Holds Bottle of Milk for Baby..... 613
Dog Leash, Safety, for Automobile..... 315
Dog Listens In on Wireless Receiving Set.. 284
Dog Race, Rat Extermination Problem Solved by..... 769
Dog, Spring, for Small Lathe..... 289
Dog with Back Broken Bound with Splints. 120
Dogs, Pinch, Made from Nails..... 470
Dogs, Scaffold, Handy Type of..... 627
Doll Crib Made like Large One..... 120
Door Jamb Cushion, Pneumatic, Stops Slamming..... 843
Door Lock, Garage, Made Convenient..... 977
Door Lock Strike Plate, Adjustable..... 773
Door, Open, Conceals Closet..... 640
Doorbell, Connecting to Lighting System... 653
Doors, Elevator, Interlocking Device for.... 592
Doors, Fireproof Bulkhead, Made of Mahogany..... 72
Doors, Garage, Device for Holding Open.... 646
Doors, Garage, Electrical Device Operates.. 905
Doors, Garage, Pneumatic Opener for..... 960
Doors, Ventilating Garage, How to Make.... 966
Doubletrees, Brace for..... 628
Draft Gauges, Many, Combined in One Instrument..... 254
Draftsmen, Armrest for..... 625
Draftsmen's Erasers Made from Umbrella Ribs..... 137
Draftsmen's Hint for Irregular Curves..... 791
Draftsmen's Rule Contains Three Instruments in One..... 272
Draftsmen's Tracing Cloth, Stretching Properly..... 288
Drag Saw, Handy, for Farm Use..... 621
Drain and Relief Valve for Steam Cylinders 512
Drainage Pipe, Bituminous Clay Used for... 408

Drains, Asphalt Sprayed, Controls Mosquitoes ..... 356
Drawbar for 24 Foot Harrow ..... 463
Drawbridge, Open, Wrecked by Steamer ..... 355
Drawer Lock, Simple, How to Make ..... 644
Drawing Rooms En Suite on Trains to Coast 688
Drawing Table, Convenient Folding ..... 615
Drawings, Enlarging Quickly ..... 324
Drawplates, Fastening on Patterns ..... 791
Dredge Clears River Channel and Builds Levees ..... 749
Dredging Outfit Cuts Canal Across Boulevard ..... 435
Dressers, Wheel, Resetting Diamonds in ..... 127
Dressing Cabinet, Baby, Has Many Conveniences ..... 279
Dressing Fixture for Angular Grinding Wheels ..... 625
Dressing Room, Beach, Small Tent as ..... 884
Dressing Table, All Metal, Sanitary ..... 934
Drier, Hair, Made from Electric Toaster and Vacuum Cleaner ..... 145
Drier, Simple Hair, Proves Very Effective ..... 113
Drift and Hammer Combined ..... 457
Driftwood, Bits of, Queer Gate Built from ..... 921
Drill and Grinder Combined Has Long Range of Speed ..... 435
Drill and Marker, Small, for Garden Use ..... 678
Drill Bit, Detachable, for Rocks Indicates Economy ..... 600
Drill Bit, Oil Well, Drills Hole and Takes a Core ..... 280
Drill Bushing, Self-Locking, for Slot Jig ..... 623
Drill Chuck, Nonslip, Requires No Key ..... 912
Drill, Electric, Grapevine Roots Planted with ..... 233
Drill, Electric, How to Make ..... 956
Drill for Use in Small Space ..... 290
Drill Head, Supplying Lubricant to ..... 455
Drill Holder with Gauge for Rapid Measurement ..... 611
Drill Plate, Handy ..... 137
Drill Press and Shaper, Indicator for ..... 797
Drill Press, Combination, Has Variety of Uses ..... 366
Drill Press, Hammer and Drift Combined for ..... 457
Drill Press, Hand, Improving ..... 966
Drill Press Stop Collar, Neat ..... 634
Drill, Sensitive, Hand Tapping on ..... 457
Drill, Traveling Multiple, for Plates ..... 46
Drill Used as Lathe Arbor ..... 304
Drilling and Tapping Machine, Combined Multiple ..... 546
Drilling Machine, Horizontal Miller Attachment Makes ..... 784
Drilling Machines, High Speed, Speed Changing Device on ..... 445
Drilling, Oil and Gas Well, Spiral Stem Simplifies ..... 232
Drilling, Oil Well, Mud Is Valuable Accessory in ..... 46
Drilling Tool, Emergency, for Wood ..... 953
Drilling, Turning, and Grinding Machine Combined Has Many Uses ..... 903
Drills, Small, Case for ..... 469
Drinking Fountain, Ice Cooled, at Williams Park, St. Petersburg, Florida ..... 111
Drinking Fountain in Honor of Church Worker, Morgan Park, Ill ..... 602
Drinking Fountain Memorial of Lieut. Wm. T. Fitzsimons, Kansas City, Mo ..... 580
Drinking Fountain, Poultry, Automatic ..... 119
Drinking Fountain Symbolizes Army, Navy, and Marine Corps, Calif ..... 581
Drive, Spiral, on Tenderfoot Mountain, by J. H. Freeman ..... 395
Driver, Lathe Center ..... 464
Driveway Lamp, Small, Shields Against Glare ..... 558
Driving Machine Tests Golf Balls ..... 913
Drug Dissolving Appliance, Electrically Heated ..... 22
Drugs, Action of, on Life ..... 655
Drydock, Floating, Planned for Southampton, England ..... 874
Drydock, Huge Mississippi River, Breaks Away ..... 235
Drydock, Largest, being Constructed at Havre, France ..... 681
Drying Machine for Strips of Colored Ribbon ..... 107
Duck, Mechanical, Can Swim or Walk ..... 777
Duck Rides on Automobile Hood ... (See Goose)
Dump Wagon, Oversize, for Road Building Work ..... 328
Dumping Body Truck, End, Mounted on Legs or Rollers ..... 78
Dumping Truck for Parcels in Chicago Post Office ..... 338
Dunn, H. H.:
Codes, Eleven Million, Electrical Machine Makes ..... 849
Dust Trap, Air Cleansing, for Auto Carburetors ..... 379
Duster, Feather, as Chick Brooder ..... 816
Dwarf, Tiny, Weighs 18 Pounds ..... 448
Dye, Kaoliang Bran Utilized in Manufacture of ..... 97
Dye, New, Colors Artificial Silk but Not Cotton ..... 22
Dyes, American, Should be Encouraged, by H. H. Windsor ..... 701
Dynamite, Bridge "Boosting" with, by H. S. Arbo ..... 11
Dynamite Used to Blow Out Oil Well Fire, by Fred A. Herr ..... 828
Dynamo and Turbine Units for Train Illumination ..... 875
Dynamometer, Traction, Gives New Soil Tillage Data ..... 594

Eagle Family, Motion Picture Camera Used to "Shoot" ..... 168
Earth Currents of Electricity Utilized ..... 600
Easel for Showcards and Photos ..... 648
Eaves Trough, Removable ..... 633
Economizer, Fuel, for Furnace ..... 74
Edger, Lawn, Made from Shovel ..... 153
Edging Machine, Lawn, Trims Sod from Sidewalk Border ..... 832
Edging Tool for Lawns ..... 321
Edwards, Harlan H.:
Header Curb, Street Car Track, Protects Pavement ..... 253
Egg Cartons, Blue, Makes Eggs Whiter ..... 257
Egg Slicer for Salads and Fancy Dishes ..... 442
Election Booths on Wheels Used as Bathhouses ..... 226
Election Day in Flood Devastated Town ..... 51
Elections, Open Air, Swiss Cantons Have ..... 166
Electric Alarm Clock Switches on Light ..... 114
Electric Alarm Kills Man byExcessive Voltage ..... 96
Electric Annunciators for Group Machine Operators ..... 456
Electric Arc Welder Has Automatic Feed ..... 378
Electric Automobiles, Heel Pedal Control Placed on ..... 419
Electric Bake Ovens Made in Sections ..... 848
Electric Battery Opener, Simple and Practical ..... 57
Electric Blower Fan Used to Cure Hay ..... 728
Electric Boudoir Lamp Has Six Intensities of Light ..... 114
Electric Bulb Filaments, How to Repair ..... 161
Electric Bulb Is Largest in World, by Bernard G. Priestley ..... 841
Electric Coffee Percolator, Self-Pouring ..... 282
Electric Connections Installed in Concrete Blocks for Temporary Lighting ..... 439
Electric Crane, One Man, for Handling Paper 108
Electric Cream Whipper Saves Labor ..... 771
Electric Curling Iron Has Swivel Attachment for Cord ..... 606
Electric Drill and Grinder Combined Has Long Range of Speed ..... 435
Electric Drill, Grapevine Roots Planted with 233
Electric Drill, How to Make ..... 956
Electric Fan, Belt Driven, with High Speed Motor ..... 82
Electric Farm Planned as Model in Sweden 185
Electric Ferryboat, Oil, on Hudson River ..... 5
Electric Ferryboats Coming to the Fore ..... 546
Electric Fire Truck Has Four Wheel Drive 493
Electric Fixture, Significant Word Adopted for ..... 277
Electric Flatiron Made in Complete Sections 246
Electric Flytrap, Ornamental ..... 368
Electric Folder, Speedy, for Printing Shops. 58
Electric Frying Pan Made of Heavy Spun Steel ..... 771
Electric Furnace for Melting Metal ..... 668
Electric Gluepot Has Rheostat Control ..... 386
Electric Hand Hoist Has Machine Hung on Its Chains ..... 235
Electric Heater Also Used as Toaster ..... 935
Electric Heater Boils Clothes in Tub ..... 935

Electric Heater, Rugged, Has Many Uses.... 594
Electric Heaters Prevent Frost in Oxygen Cylinders ..... 391
Electric Heaters Strapped to Sides of Tank. 538
Electric Hoist, Combination, and Overhead Conveyor ..... 24
Electric Hot Plate for Heating and Toasting 606
Electric Hot Plate Has Disks for Catching Crumbs and Drippings..... 771
Electric Incubator..... 832
Electric Incubator Turns All Eggs at Once.. 280
Electric Iron Has Comfortable Grip Handle. 607
Electric Ironer Makes "Ironing Day" a Pleasure ..... 527
Electric Lamp Adjustable as Table, Desk, or Wall Light..... 770
Electric Lamp Filaments, Double, Have Longer Life..... 234
Electric Lamp Holders, Handy..... 817
Electric Lamp, Ornamental Cardboard, Can be Folded Flat..... 210
Electric Light Bowls, Keeping Insects from. 802
Electric Light Bulbs, Small, Removing..... 489
Electric Light Fixture, Cheap Indirect..... 156
Electric Light Fixtures, Protecting While Using Vacuum Cleaner..... 490
Electric Light for Refrigerator..... 489
Electric Light on Typewriter Aids Deaf Typist ..... 760
Electric Light Plug, Rotating, for Attachments ..... 878
Electric Lighting Tubing Comes Already Wired ..... 898
Electric Lights, Windmill Atop City Home Feeds ..... 824
Electric Measuring Device for Minute Dimensions ..... 604
Electric Motor, Attaching to Washing Machine ..... 318
Electric Motor, Squirrel Cage Induction, New Form of..... 614
Electric Muffle Furnace, How to Make..... 957
Electric Power, Two Cities Exchange, as Emergency Measure..... 692
Electric Prayer Wheels Operated in India... 86
Electric Radiant Heater, How to Make..... 982
Electric Railway, Miniature, Demonstrated at English Exhibition..... 35
Electric Scaling Tool for Metal Surfaces... 6
Electric Sifter for Sand and Soil..... 292
Electric Sifter for Straining Liquids..... 882
Electric Sign, Huge, Advertises the City of Bristol ..... 603
Electric Skinning Tool for Packing Houses. 437
Electric Soldering Iron, How to Make..... 139
Electric Soldering Machine for Jewelers.... 830
Electric Steam Radiator Heats Tea Wagon. 2
Electric Stove for Making Toast, Coffee, and Frying ..... 279
Electric Timing Mechanism for Various Uses 72
Electric Toaster Turns Both Slices at Once.. 607
Electric Traffic Signal Operated from Sidewalk ..... 687
Electric Truck Slogan, Prizes Offered for... 983
Electric Vulcanizer, New, for Dentists..... 897
Electric Water Heater Fits on Faucet..... 892
Electric Wire, Neat Tips for..... 152
Electric Wiring, Home, Used as Wireless Aerial ..... 171
Electric Woodworking Machinery Has Multifarious Uses ..... 113
Electrical Energy, Amount of, for Chicago's Railroad Terminal ..... 180
Electrical Grounds, Testing for, During Winding Operations ..... 627
Electrical Oscilloscope, High Speed Machines Studied with ..... 728
Electrical Output of Power Station Pooled in England ..... 543
Electrical Plug Attachment Accommodates Two Utensils ..... 771
Electrical Shipment, Record, to South America ..... 185
Electrical Shock, Fatal, from Peculiar Cause 664
Electrical Transformer for Heating Railroad Car Wheel Tires..... 933
Electrical Wire, Putting Rubber Sleeving on 623
Electrical Wiring Knot Protects Fixtures.. 619
Electrically Heated Bath Tests Thermometers ..... 180
Electrically Heated Drug Dissolving Appliance ..... 22
Electrically Heated Tool for Setting Roller Jewels in Watches..... 213
Electricity, Earth Currents of, Utilized..... 600
Electricity—"Growler" Rope Winding as Heat Conductor ..... 604
Electricity—Rectifiers, Mercury Arc, of Large Capacity ..... 10
Electricity—Transformer, New Type, for Direct Current ..... 598
Electrotyping Stainless Steel..... 795
Elements, Chemical, Artificial Transmutation of, by Rogers D. Rusk..... 917
Elephant, Circus, Does the "Shimmy"..... 777
Elephant Family Group, Largest African... 273
Elevated Railway, Chicago, Auto Busses for 930
Elevator Doors, Interlocking Device for.... 592
Elevator, Grain, Rebuilding Is Big Task.... 104
Elevator, Mont Blanc, Resume Work on.... 383
Ellipse, Any Kind of, Instrument for Describing ..... 410
Emery Sparks, Catcher for..... 306
Emery Wheel Attachment for Farm Tractors 565
Emigration, Rate of, by H. H. Windsor..... 701
Enamel, Making to Flow Easily..... 476
Engine, Aerial, Establishes New Endurance Record ..... 879
Engine—Air Motor, Double Cylinder, Smaller than Match Box..... 268
Engine, Auto, Runs Village Water Plant.... 665
Engine Bearings, Auto, Clamp Aids in Fitting ..... 462
Engine Connecting Rods for Model Machinery ..... 477
Engine, Crude Oil Airplane, Developed in England ..... 858
Engine Cylinder Grinding Machine Attachable to Lathe..... 44
Engine Cylinder Head Plugs, Removing.... 464
Engine, Hopper Type, Cooling System for.. 456
Engine Muffler for Home Lighting Plants... 483
Engine Muffler, Venturi Tube Principle Used in ..... 583
Engine, Neat Rotary, Weighs Ten Pounds.. 402
Engine, Old Auto, Aids Ice Harvest..... 351
Engine Piston, Adjustable, Controls Compression Space Volume..... 882
Engine Piston, Novel, Keeps Oil from Combustion Space ..... 610
Engine Pistons, New Lightweight, with Curbed Expansion ..... 904
Engine Shelter, Small ..... 461
Engine, Two Cycle, with Auxiliary Cylinders ..... 528
Engine Valves, Device Cleans without Removing ..... 282
Engine Valves, Overhead, Tool Aids in Work on ..... 490
Engineer, Recreation, Added to Forest Service ..... 663
Engineering Museum, National, Planned at Washington ..... 716
Engines, German Submarine, Drives English Light Plant ..... 263
Engines, Marine Oil, Remarkable Development in ..... 118
Engines—Motors, Airplane Liberty, Improved ..... 774
Engines, New Double Acting, of Modified Diesel Type ..... 550
Engravings, Proofing Easily ..... 963
Enlarger, Homemade Vertical..... 479
Enlarging Maps and Drawing Quickly..... 324
Entrance Sign, Inlaid Glass, Is Artistic..... 428
Envelopes, Small, Made from Large Ones.... 311
Eraser, Draftman's, Made from Umbrella Ribs ..... 137
Eraser, Fountain Pen, like Tip on Pencil... 180
Eraser, Typewriter, Holder for..... 322
Essay, Historical Novel, Prize Offered for.. 491
Essay, Pasteur, Prize Offered for..... 327
Essays, Americanism, Prizes Offered for.... 327
Essays, Historical, Prize Awarded for..... 983
Essays, "The Story of Mankind," Prizes Offered for ..... 163
Ether, Fishing the, (Poem) by George F. Staat ..... 492
Examinations, U. S. Civil Service, to Fill Vacancies and Positions.....164, 327, 491, 819
Excavating Machinery, Modern, Promotes Work of Archaeologists..... 822
Excavation, Deepest Rock, for New York Store, by T. Benjamin Faucett..... 384
Excavation Skid, Unbraced, for Removing Soil ..... 471
Excavator, Endless Tread Traction Rig on. 764
Exchange, English, Table for Computing... 624

Exhibition, Beautiful Peace, Japanese Hold. 401
Exhibition Building Given Canada by Lucerne, Switzerland, to Promote Trade Relations ..... 226
Exhibition, English, Miniature Railway Demonstrated at ..... 35
Expedition, North Pole, English War Pilot to Finance ..... 937
Explosion—Gas Holder Injures 100 People.. 509
Explosion in Italy Does Great Damage..... 851
Exposition, Brazilian Centennial, Unofficial American Building to be Erected at..... 112
Exposition Buildings, Brazilian, at Rio De Janeiro ..... 698
Exposition, "Days of '49"..... 367
Exposition Illumination, Spectacular Brazilian ..... 496
Exposures, Snapshot, Timing..... 156
Extension "Hand" for Stores..... 291
Extension, Safe Ladder, How to Make..... 141
Extractor, Pneumatic Cork, Acts with Air Pressure ..... 79
Eye Protection for Motorists..... 162
Eye, Winking, on Auto Windshield as Advertising Novelty ..... 859
Eyeglass Lenses, Instrument Measures, by Light Waves ..... 700
Eyeglass Spring, Broken, Emergency Repair for ..... 801
Eyeglasses, Color and Shape, to Match Hairdress ..... 658
Eyesight, Campaign to Save, to be Country Wide ..... 837

Fabric Knife for Tire Repairmen..... 947
Fabrics, Bursting Point of, Apparatus to Test ..... 171
Fabrics, Stenciling Colored Designs on..... 978
Facing Tool, Novel..... 134
Factory Trucks, "End Grain" Wooden Wheels for ..... 944
Falls, Water, World's Largest, Seldom Visited ..... 65
Fan Attachment Cools Auto Disk Wheels... 566
Fan, Belt Driven Electric, with High Speed Motor ..... 82
Fan Belts, Rawhide Used in..... 117
Fan Coils and Mountings for Wireless..... 498
Fan, Diminutive Revolving, Operated by Hand ..... 84
Fan, Electric Blower, Used to Cure Hay..... 728
Fan, Kitchen Ventilating, Easily Installed.. 576
Fan Pulley Pin, Locking..... 784
Farm, Electric, Planned as Model in Sweden 185
Farm Gong, Simple Improvised..... 963
Farm Implements, Emergency Shank for... 626
Farm, Miniature, Shows Crop Rotation at Fair ..... 513
Farmers, Oldest U. S., Prizes Offered in Search for ..... 655
Faucet Water Motor for Various Kitchen Duties ..... 279
Faucett, T. Benjamin:
Store, New York, Deepest Rock Excavation for ..... 384
Feather Corsage Shield Is Colorful Novelty. 66
Feather Duster As Chick Brooder..... 816
Feed Box, Portable, for Horses..... 483
Feed Box Prevents Stock from Upsetting.... 976
Feed Stand, Poultry, Conveniently Arranged 899
Feeding Box, Self, for Poultry..... 647
Fence, Discarded Porch Railing Used to Make ..... 620
Fence Is Strange "Pipe Organ" Heard on Stone Mountain ..... 900
Fence on Glacier Point Protects Visitors.... 191
Fence Replaced by Posts along Highway in Calif. ..... 767
Fence Staples, Hay Hook Used to Pull..... 452
Fence Wire as Concrete Reinforcement..... 968
Fences, Wire, Tractor Aids in Stretching.... 500
Fender, Automatic Life Saving, for Autos... 576
Ferns, Hawaiian Tree, Found to be Source of Starch ..... 74
Ferris Wheel, New York, Blown from Its Moorings ..... 195
Ferry, Passenger and Auto, on Detroit River 531
Ferry, Yellow Stone Trail, Columbia River Bridge Eliminates ..... 686
Ferryboat, Oil Electric, on Hudson River... 5
Ferryboats, Electric Driven, Coming to the Fore ..... 546
Fiber Boxes, Strength of..... 128
Fiber, Kapok, Textile Industry Trying to Spin ..... 752
Fiber, Machining and Finishing..... 964
Fig Container, Ripe, for Shipping without Injury ..... 108
File and Monkey Wrench as Emergency Pipe Wrench ..... 133
File for Brief Case..... 474
File Grip, Rubber, Protects Hands..... 365
Files, Catalog, Making Partitions for..... 318
Filings, Platinum, Cleaning..... 452
Filler, Battery Cell, Prevents Overflow..... 614
Fillet Tools, How to Make..... 305
Film, American Coal Mining, to be Shown Abroad ..... 432
Film Hanger, Cut, Made from Spring..... 152
Film Rewinding Attachment Stops Misframed Movies ..... 878
Film, 100 Feet of, Finished in Holder at Same Time ..... 761
Films, Industrial Movie, to be Censored by Experts ..... 109
Films, Photographic, Ruined by Carnotite Ore ..... 404
Films, Roll, Reel for Developing..... 326
Films, Soaking in Water before Developing. 486
Filter for Catching Fine Powdered Glass.... 435
Filter, Water Separating, on Gasoline Feed Pipe ..... 270
Finger Board, Corrugated, Aids Violin Players ..... 569
Finishing Tool, Double Faced..... 626
Fire Alarm System, Modern, for New York.. 570
Fire Car, Proving Ground, Has Complete Outfit ..... 760
Fire Engine, Detachable Pumping Unit on.. 216
Fire Engine, "Water Gun," Takes 12 Lines of Hose ..... 57
Fire Engine, Wrecked, Acts as Warning Sign 75
Fire Escape and Balcony Attractively Combined ..... 664
Fire Extinguisher, Cement Successfully Used as ..... 444
Fire Extinguisher Holster for Watchman... 302
Fire Fighters, Forest, Airplane Aids..... 494
Fire Fighting Unit Speeds on Motorcycle.... 92
Fire Horses Make Last Run as Feature of Parade ..... 35
Fire, Hotel, Demonstrates Worth of Concrete ..... 211
Fire Hydrants Made Conspicuous by Painting Them Yellow..... 282
Fire, Oil Well, Dynamite Used to Blow Out, by Fred A. Herr..... 828
Fire Prevention, Teaching in Schools, by H. H. Windsor..... 29
Fire Risk, Wireless Telephone, Avoidable, by H. H. Windsor..... 31
Fire Truck, Electric, Has Four Wheel Drive. 493
Fireboats, New York, High Pressure Pumps for ..... 903
Firemen, Central Station Drills for Training 658
Fireplace, Huge, and Shelter for Motorists, Seattle, Wash. ..... 603
Fireplace, Open Air, for Picnickers in Calif.. 274
Fireplace, Open, Hot Water Heating from... 842
Fireplaces, Outdoor, Carbon Briquettes as Fuel Demonstrated in..... 208
Firepot, Stove, as Lawn Vase..... 156
Fires, Forest, Parade to Prevent..... 574
Fish Bait Snaps like Animal Trap..... 353
Fish Butter Displaces Cow's, by Francis Dickie ..... 433
Fish, Drugged, South Sea Islanders Easily Capture ..... 889
Fish Flyhook Holder, Convenient, Made of Brass Spring ..... 72
Fish, Flying, Have Best Soaring Wings..... 423
Fish, Flying, Signalize Japanese Boy Day, by A. G. Clutterbuck..... 414
Fish—Halibut, Big, Caught with Wooden Hook ..... 241
Fish, How to Bake in Clay..... 804
Fish Scaler, Currybomb as..... 160
Fishhook Attachment for Holding Flies..... 146
Fishhook, Automatic Grab..... 180
Fishhook, Binding to Leader for Salt Water 162
Fishhook, Extracting from the Flesh..... 654
Fishing Contest, Novel, High Powered Hunting Rifles Offered in..... 163
Fishing—Crumbs as Lure for Fish..... 637
Fishing, Large Dip Net and Derrick Filipinos Use for..... 71

Fishing Rod, New, Eliminates Sliding and Sideway ..... 447
Fishing Rod, Re-Serving a..... 322
Fishing Season, Clever Window Display for. 426
Fishing, Shark, Indicating Float for..... 24
Fishing the Ether, (Poem) by George F. Staat ..... 492
Fishing—Trolling Rig for Autumn Lake Trout ..... 653
Fishing—Trot-Line, Taking Up..... 646
Flag, Enameled Upholstering Nails Used to Make ..... 431
Flag Standards, Small, Made from Door Stops ..... 977
Flagpole, Illuminated, Is Also Wind Vane... 938
Flags, Steamship, Now Washed..... 368
Flagship, British, Model of, on American Auto Truck ..... 423
Flash Papers, Varicolored, Making for Stage Effects ..... 803
Flashlight, Automatic Pistol Combined in... 244
Flashlight Bracket for the Bed..... 155
Flashlight, Pocket, Swivel Clip for..... 940
Flashlight Razor Permits Shaving in the Dark ..... 664
Flatiron, Electric, Made in Complete Sections ..... 246
Fliers, around the World, Halted in India... 520
Flight, around the World, British Airmen Start ..... 186
Flight, around the World, Halted in India... 520
Flight, Oceanic, Portuguese Airman Finish.. 191
Flight, One Stop, from Florida to Calif..... 688
Flight, Test, at Night on Continental Route. 99
Float, Improvised Siphon, and Support..... 311
Float, Indicating, for Shark Fishing..... 24
Flood—Cloudbursts, Two, in Week at Syracuse ..... 380
Flood Control, Rio Grande, Texas Plans.... 707
Flood Devastated Town Offers Strange Sights 51
Flood, New Orleans, Causes Raising of River Front, by Thomas Ewing Dabney..... 369
Floodlights on Trains, by H. A. Lane..... 514
Floor Lamp, Adjustable, for Garage and Shop 514
Flooring Clamp, Homemade..... 631
Flooring Saw for Wiremen..... 632
Floors, Polished Hardwood, Preventing Slipping on ..... 317
Flotsam, Swimming Pool, Skimming from the Surface ..... 461
Flour Port, Largest, Philadelphia May become ..... 499
Flourmill, State Owned, Nearing Completion 927
Flower Basket, Hanging, How to Line..... 153
Flower Bed Borders Made from Auto Rims .....316, 475
Flower Display Holder Fits Any Size Pot... 730
Flower or Bird Poem, Prize Offered for..... 327
Flower Vase, Collapsible, for Long or Short Stems ..... 770
Flower Vases, Large, 1,000 Gallon Tanks Water ..... 906
Flowers—Clematis Trained to Reproduce American Flag ..... 721
Flowers—Daisies, Cultivation of, a Paying Enterprise ..... 720
Flue Base Adjustable to Pitch of Roof..... 400
Flux, Soldering, in Stick Offers Advantages. 858
Flux, Soldering, Keeping Handy on Blowtorch ..... 135
Flyhook Holder, Convenient, Made of Brass Spring ..... 72
Flying Boat, Giant, Carries 27 Persons..... 48
Flying Boat, New, Named for Wilbur Wright 845
Flying Boat, Small, Turned Out in Germany. 525
Flytrap, Ornamental Electric..... 368
Flytraps, Street, Installed in Front of Stores 439
Flywheel Gears, Auto, Fixture for Working on ..... 961
Flywheels and Pulleys, old, Replacing..... 451
Flywheels, Enameled, Steel Truck for..... 453
Focus, Sharp, Making Sure..... 489
Fog Signal, Queer, Old Time Cannon Used as ..... 447
Folder, Speedy Electric, for Printing Shops. 58
Folger, R. C.:
  Air Express, Non Stop, Landing from..... 510
  Airplane Lands in Grand Cañon..... 838
  Dam, Wilson ..... 670
  Gliders and Soaring Flight..... 679
  Memorial, George Washington Masonic National ..... 518
Food, Warm, Tractor Hauls for Patients.... 84
Football Team Holds Tractor for "Downs". 840
Footrest, Automobile Auxiliary Tank Used as 738
Footrest, Shoe Shining, Swings Out of Way. 530
Ford, John Anson:
  Police Department, Science Becomes First Aid of ..... 869
  Foreign Trade Committees Publish Sales Book ..... 272
Forest Fire Fighters, Airplane Aids..... 494
Forest Fires, Parade to Prevent..... 574
Forest, National, Playground for People in. 586
Forest Playground, National, Given to Children ..... 171
Forest Service Men, Memorial Honors..... 708
Forest Service, "Recreation Engineer" Added to ..... 663
Foresters Climb High Tower as Daily Routine ..... 609
Forestry—Tree Seeds Live through Forest Fires, by W. I. Hutchinson..... 901
Forests, Great Britain's, being Restored by Government ..... 563
Fork and Spoon Combination..... 607
Form for Pouring Concrete Hollow Walls in Courses ..... 715
Fort, Mysterious Floating, Opened to Visitors ..... 390
Fortification—Blockhouse, Old, Located in Penn. ..... 602
Foundation, New Theater, Placed While Players Perform, by Everett J. Lovett.... 25
Fountain, Ice Cooled Drinking, at Williams Park, St. Petersburg, Florida..... 111
Fountain in Honor of Church Worker, Morgan Park, Ill..... 602
Fountain Memorial of Lieut. Wm. T. Fitzsimons, Kansas City, Mo..... 580
Fountain, Miniature, Humidifier and Deodorizer in ..... 822
Fountain Monument Symbolizes Army, Navy, and Marine Corps, Calif..... 581
Fountain Pen and Refillable Pencil in One.. 765
Fountain Pen Eraser like Tip on Pencil..... 180
Fountain, Poultry Drinking, Automatic..... 119
Frame for X-Ray Tube and Plate Holder... 343
Frame, Wooden, for Testing Base Ball Pitcher's Skill ..... 284
Freeman, J. H.:
  Drive, Spiral, on Tenderfoot Mountain.... 395
Freezer, Ice Cream, All Metal..... 770
Freight Cars, Truckmen's Safety Toe Board for ..... 50
Fruit and Vegetable Slicer Cuts Any Thickness ..... 935
Fruit—Apples, All Winter, Developed at State Fruit Farm.....203, 820
Fruit—Apples Monogrammed in Western Orchard ..... 710
Fruit Display Stand, Sanitary, Also Preserves 80
Fruit—Fig Container, Ripe, for Shipping without Injury ..... 108
Fruit—Grapes, Mediterranean, Grow in North Carolina ..... 929
Fruit Jar Cap, Slotted, Aids in Opening..... 443
Fruit Jar Caps, Tight, How to Loosen..... 472
Fruit Jar Holder, Flexible Band, for Removing Top ..... 607
Fruit Jars, Preventing from Cracking While Canning ..... 485
Fruit—Peaches Resemble Pumpkins on Ohio Farm ..... 382
Fruit—Pears, Ripeness of, Machine for Testing ..... 82
Fruit Preserving Process Saves Crop..... 379
Fruit Strainer Eliminates Stained Hands.... 443
Fruit Trees Injured by Winter Sun..... 952
Frying Pan, Electric, Made of Heavy Spun Steel ..... 771
Frying Pan Turns Eggs by Giving Sharp Jerk ..... 279
Fuel Economizer for Furnace..... 74
Fumes, Poison, in One Apartment Kill in Another ..... 4
Funeral Conducted in Boats in Flooded Town 51
Fungus Treatment, Root, to Save Citrus Trees ..... 416
Funnel Arrangement Prevents Air Binding.. 326
Funnel Strainer Has Adjustable Screens.... 771
Fur Market, Trapper's Roadside, Monopolizes Profits ..... 232
Furnace Attachment Is Fuel Economizer.... 74
Furnace, Electric, for Melting Metal..... 668
Furnace, Electric Muffle, How to Make..... 957
Furnace Gas Burner, Homemade..... 780
Furnace, Gas Fired Bench, Has Many Uses.. 527

Furnace, Gas Fired Melting, Has Three Burners ..... 428
Furnace, Pipeless, Auxiliary Radiator for... 478
Furniture:
Bathroom Stool Contains Shoe Shining Stand ..... 114
Cabinet, Music Roll, Automatic..... 496
Chair, Bed, and Writing Desk Combination with Swinging Arm ..... 115
Chair, Folding Metal, Is Strong and Neat. 273
Davenport Has Adjustable Headrest..... 278
Dressing Table, Metal, Sanitary..... 934
Table, Breakfast Nook, Improved..... 146
Table, Dining, Made from Small Gate Leg Table ..... 803
Tea Wagon, Electric Steam Radiator Heats 2
Fuse Block, Multiple ..... 788
Fuse, Plug Type, Refillable, Simple and Efficient ..... 366
Fuse, Renewable, Polyphase Motors Prevented from Single Phasing with..... 772

Gaines, Cleveland:
Chicago's Program of Civic Improvement. 19
Game, Ancient Chinese, Now Fad in America 898
Games:
Horseshoe Pitching Arena Has Twenty Courts ..... 605
Lawn Checkers, Squares of Grass Used in 250
Marble Tournament in Front of New York City Hall ..... 448
"Push Ball" Game Played with Automobiles ..... 81
Gander Rides on Automobile Hood..... 942
Garage, Adjustable Floor Lamp for..... 514
Garage Door Lock, Convenient..... 977
Garage Doors, Device for Holding Open.... 646
Garage Doors, Electrical Device Operates... 905
Garage Doors, Pneumatic Opener for..... 960
Garage Doors, Ventilated, How to Make.... 966
Garage, Handy Remover Mixture for..... 142
Garage or Bungalow at Owner's Option..... 117
Garage, Portable Concrete, Easy to Assemble 233
Garage Roof, Automobile Parking Space on. 39
Garage Service Can for Gasoline and Oil.... 62
Garage Wall Fixtures Substituted for Hoist 947
Garbage Can Holder Prevents Theft..... 892
Garbage Can Receiver, Underground..... 787
Garden Drill and Marker, Small..... 678
Garden Hose Roller Clamp Replaces Reel.. 736
Garden in Rear of Bookstore in Pasadena, Calif. ..... 110
Garden, Italian, Made in America..... 45
Garden Set Has Checkered Cushion, Footstool, Table and Chair Cover..... 607
Garden Set Has Five Tools for One Handle.. 534
Garment, Hospital, Made Easy to Remove.. 40
Gas Booster, New, Advantages of, in Large Plants ..... 755
Gas Burner Cooks and Heats Water at Same Time ..... 34
Gas Burner, Homemade, for Heating Furnaces ..... 780
Gas Burners, Home, Rules for Testing..... 407
Gas Burners, New Convertible Fixture for.. 330
Gas, Escaping Hydrogen, Discover Cause of Ignition of ..... 22
Gas Holder, Explosion of, Injures 100 People ..... 509
Gas, How Manufactured and Delivered..... 938
Gas Lighter, Automatic, for Typesetting Machines ..... 305, 983
Gas Mask Hose Connected to Distant Blower. 922
Gas Meter, New, Positive Blower Mechanism Basis of ..... 567
Gas Meter Valve, Automatic, Reduces Damage by Fire ..... 933
Gas, Nonexplosive, New Design Airship to Use ..... 9
Gas, Nonexplosive, Now Used for Toy Balloons ..... 53
Gas Power Plant, Large, Proves Efficient... 578
Gas Range Has Efficient Method of Combustion ..... 556
Gas Valve, Design of, Is Radical Departure. 609
Gases and Vapors, New Method of Cleaning 920
Gases, Direct Reading Instrument Measures Flow of ..... 906
Gasket, Emergency, Made of Lamp Cord.... 490
Gaskets, Fuse Wire, for Tight Joints..... 781
Gaskets, Old, Shims Cut from..... 299
Gasoline Attachment for Autos Proves Economical ..... 229
Gasoline Containers, Safety Venting Attachment for ..... 875
Gasoline Pump, Computing, for Service Stations ..... 897
Gasoline Railroad Car for Short Trips..... 98
Gasoline Railroad Trains Cut Operating Costs ..... 73, 748
Gasoline Service Can for Garages..... 62
Gasoline Tank, Handy, for Garage Repair Work ..... 247
Gasoline Tank Protector, Odd Appearing.... 514
Gasoline Tank Trucks, Safety Valves on Faucets of ..... 928
Gasoline Tank Tube Prevents Explosions... 611
Gasoline Truck Gives Filling Station Service 533
Gasoline Vaporizer for Automobiles..... 368
Gate, Queer, Built from Bits of Driftwood.. 921
Gate, Self-Closing, How to Make..... 795
Gate, Sliding, How to Make..... 974
Gateposts, Concrete, Forms for ..... 789
Gauge, Air Line, for Tires Prevents Accidents ..... 710
Gauge, Bridge Tide, Helpful to Navigators.. 746
Gauge for Setting Lathe Tools ..... 619
Gauge, Handy Siding, How to Make..... 797
Gauge Holder and Reamer Combined..... 133
Gauge Indicator Adaptable for Various Liquids ..... 762
Gauge, Micrometer Caliper, for Inspectors.. 53
Gauge, Micrometer Height ..... 456
Gauge, Simple Boring ..... 288
Gauge, Test Indicator..... 463
Gauge, Tube Marking ..... 453
Gauge, Wire, Novel ..... 617
Gauges, Draft, Many Combined in One Instrument ..... 254
Gear Changes, Automobile, Made Noiseless with New Indicator ..... 227
Gear Teeth, Inspection of, by Enlarged Projection ..... 237
Gear, Water Drawing, of Ancient Days..... 376
Gears, Auto Starting, Cleaning..... 647
Gears, Auto Starting, Lengthening Life of.. 640
Generator, Attaching to Boat Engine..... 155
Generator Brushes, Small Improved..... 787
Geometric Device, Improved, for Mechanics. 932
Germs—Bacteria Exhibit of 655 Different Types ..... 832
Gertsmon, S.:
Mount Hood, Looping ..... 559
Girders, Steel Cables Molded in Concrete being Tested for ..... 192
Girl, Crippled, Can Use Roller Skates..... 449
Girl Swimmer, Small, Tows Boatload of Men with Hands Tied ..... 777
Girls, School, Knit Sweaters for Prizes..... 613
Glass Cake Baker with Hole in Center..... 443
Glass, Drilling Holes in ..... 147
Glass, Fine Powdered, Filter for Catching.. 435
Glass, How to Write on..... 148
Glass, Motorcycle Fleet Sweeps up, in Street 349
Glass, Mountain of, After Fire Had Razed Plant ..... 846
Glass, Raw, Made from Silica in Czecho-Slovakia ..... 891
Glass Reflectors, Crystal, for Spotlights.... 112
Glasses, Brush Machine Quickly Cleans..... 228
Glasses, Color and Shape, to Match Hairdress 658
Gleason, Gordon P.:
Canal Terminal, World's Largest..... 264
Glider, British, Soars Nearly Two Hours.... 868
Glider, Experimental, Built for Technical School ..... 220
Glider, Motorless, Flies Five Minutes..... 365
Gliders a Fad, by H. H. Windsor..... 704
Gliders and Soaring Flight, by R. C. Folger 679
Globes, Inverted Light, Keeping Insects from 802
Glove Sizer Displaces Tape Measure..... 535
Glue Container Shaped like Fountain Pen.. 182
Gluepot, Electric, Has Rheostat Control.... 386
Goal Post, Polo, Made Harmless at Hong Kong Club ..... 32
Goat Team Travels 1,800 Miles..... 449
Goblet Holder, China Closet, Saves Space... 162
Goggles, Colored Celluloid, Protect Motorists' Eyes ..... 162
Gold, Dental Machine Casts under Pressure. 281
Golf Ball Scale Gives Weight and Size..... 941
Golf Balls, Driving Machine Tests..... 913
Golf Balls, New, Machine for Testing Resiliency of ..... 572
Golf Balls, Stray, Lawn Mower Driver Shielded from ..... 593
Golf Chart Is Primer for Beginners..... 545
Golf Clubs, How to Identify..... 817
Golf Clubs, Steel, Allowed by Western Association ..... 447

Golf Stroke Counter Worn on Player's Wrist 524
Golfers, Leather Device Prevents Overswing of 569
Gong, Simple Farm, How to Make 963
Goose Rides on Automobile Hood 942
Gophers Commit Suicide with New Trap Gun 605
Gophers, Two, Pose for Their Picture 776
Grab Hook, Automatic, for Fishing 180
Grab Tongs, Automatic, of New Design 940
Gradient Meter, Auto, Mounted on Dash 747
Grain—Barley, New Variety of, Has Striking Qualities 113
Grain Binder, New, Cuts 35 Acres Per Day 739
Grain—Corn, Ear, Air Blast Outfit Loads into Cars 394
Grain Elevator, Wrecked, Rebuilding a Big Task 104
Grain Shocker, Automatic, Works Successfully 173
Grain Soaker for Swine 291
Grain Spout, Thresher, Automatic Shut Off for 142
Grain—Wheat Cut, Threshed, Ground and Cooked at One Time 739
Grape Vineyards, California, Perambulating Incinerators for 708
Grapes, Mediterranean, Grow in North Carolina 929
Grapevine Roots Planted with Electric Drill 233
Grass, Cutting in Dry Weather 317
Grass Cutting Machine with Three Mowers 269
Grass Mower, Motor Driven, Also Rolls Lawn 56
Grass Seed, Kentucky Blue, Is Valuable By-Product 338
Grass Seed Protected on Terraces 156
Grate, Auxiliary, for Burning Low Grade Coal 52
Grate Bars, Protection of, by Aluminum Coating 574
Grate Fire, Open, Hot Water Heating from 842
Gravel, Demand for, Makes Waste Land Valuable 415
Gravel, Road Building, Hardness of, New Device Tests 93
Grease Cups, Auto, Made Convenient 977
Grease Gun, Air Operated, for Autos 583
Grease Gun, Device for Filling 634
Greeting Cards, How to Make 965
Grinder and Drill Combined Has Long Range of Speed 435
Grinder Attachment for Squaring Stock 958
Grinder, Bench, Homemade Utility 466
Grinder, Cylinder, for Lathes and Millers 592
Grinder Guard, Lathe 453
Grinder, Portable Disk, Has Graduated Index Table 220
Grinder, Shear Serrating, Is Speedy and Accurate 404
Grinder, Valve, for Garages Has Speed and Accuracy 868
Grinding Balls, High Carbon, Give Good Service 330
Grinding, Drilling, and Turning Machine Combined 903
Grinding Fixture, Chamfer, for Thread Chasers 534
Grinding Machine, Armor, Largest in the World 772
Grinding Machine, Cylinder, Attachable to Lathe 44
Grinding Machine, Internal, for Quantity Production 420
Grinding Machine, Portable, Operated by One Man 426
Grinding Machines, Tool Holding Attachment for 533
Grinding Wheel Attachment for Farm Tractors 565
Grinding Wheels, Angular, Fixture for Dressing 625
Grip, Rubber File, Protects Hands 365
Grooves, Oil, Cutting in Pulleys 455
Grounds, Electrical, Testing for, During Winding Operations 627
"Growler" Rope Winding as Heat Conductor 604
Guard, Automatic Safe, Operates with Swing Saw 85
Guard, Clothing, and Adjustable Banjo Bridge 691
Guard Dishpan, Keeps Cats from Birdhouses 646
Guard, Lathe Grinder 453
Guard, Radiator, for Tractor 618
Guard, Shoe, Prevents Soiling and Damage 817
Guard, Window Ledge 482
Guide, T-Square, for Draftsmen 588
Guitar, New Hawaiian, Rests on Player's Lap 83
Gulls, Sea, Drop Clams on Roofs to Break the Shells 691
Gun, Antibandit, in Demonstration, by Eric A. Dime 41
Gun—Pistol, Automatic, Combined in Flashlight 244
Gun—Rifle, .22 Caliber, Rechambering 464
Gun Sight, New Design, Easy to Manipulate 112
Gun, Tiny, Concealed in Palm of Hand 913
Guns, High Powered Hunting, Offered in Novel Fishing Contest 163
Guns—Rifles, New Superaccurate, of U. S. Standard Caliber 846
Gymnasium, New, Completed at Bloomington, Ill. 930
Gyroscope Instrument, Flight of Airplane Shown by 778

Hair Drier Made from Electric Toaster and Vacuum Cleaner 145
Hair Drier, Simple, Proves Effective 113
Hairbrush, Renewable Bristle, Folds like Book 934
Hairdressing, "Marcel," to be Observed in France 983
Hairpin Machine, Compact Automatic 380
Halibut, Big, Caught with Wooden Hook 241
Halter Made from Auto Tires 477
Hammer and Drift Combined 457
Hammer, Self Contained, and Chisel 127
Hammock Net, New, Made like Bag 400
Hand Bag, Traveling, Has Side Compartment for Handy Articles 278
Hand, Extension, for Stores 291
Handle, Extension Lawn Mower 315
Handlebar, New Adjustable, Is Convenient 545
Handles, Ball, Jig for Drilling 305
Handles, Broom, Made Tubular Instead of Solid 8
Hangar, Giant Airship, Completed in Texas 420
Hanger and Brush Combination for Clothes 196
Hanger, Clothes, for Closetless Rooms 316
Hanger, Evening Dress, Prevents Shoulder Straps from Slipping Off 607
Hanger for Cut Films Made from Spring 152
Hanger, Telephone Directory, Simple and Convenient 749
Hangers, Clothes, with Two Hooks and Suspended from Wall Bracket 770
Hanging Baskets, How to Line 153
Hansom Cab, Attractive, American Auto Makes 590
Harbor, New, to Make Atlantic Passages Shorter 568
Harbor Terminal, World's Largest, by Gordon P. Gleason 264
Hardness Testing Device for Road Travel 93
Hardwood, Yellow Stain in 632
Harness Made from Auto Tires 477
Harrow Prevented from Injuring Trees 475
Harrow, 24 Foot, Drawbar for 463
Harvester, Corn, Homemade Simple 624
Harvester, Sugar Beet, Automatic 543
Hat Holder, Handy, for Auto Tops 280
Hats, Felt, Waterproofing 982
Hats, Rain Proof Material for Protecting 278
Hats, Soft, Support Prevents Sagging and Kinking of 279
Hay Curing, Electric Blower Fan Used for 728
Hay Hook, Staples Pulled with 452
Hay Loader Economical for Farmer 908
Hay, Timothy, When to Harvest 469
Hayrakes, Motor Truck, Function Efficiently 35
Head Protector, Auto Top, Inflated Rubber 446
Header Curb, Street Car Track, Protects Pavement, by Harlan H. Edwards 253
Headlight Attachment for Driving on Dark Roads 323
Headlight, Auto Trouble Lamp Used as 818
Headlight, Automobile Trouble Lamp Made from 475
Headlight Bulbs, Preventing Vibration of 316
Headlight Controller, Auto, Dims Lights Gradually 879
Headlight Reflectors, Tarnished, Restoring 816
Headlight Rims, Tool for Removing 974
Headlights, Auto, Switch Brightens 489
Health Promotion Week Set Aside 819
Hearing, New Analysis of, Discovered by Laboratory Experiments 656
Heat Bag, Chemical, for Many Uses 94
Heat Indicator, Auto, Has Dial on Dash 356

Heater, Carburetor, Vaporizes Heavy Particles of Gasoline ..... 773
Heater, Electric, Also Used as Toaster ..... 935
Heater, Electric, Boils Clothes in Tub ..... 935
Heater, Electric Radiant, How to Make ..... 982
Heater, Electric Water, Fits on Faucet ..... 892
Heater, Hot Water, in Open Grate Fire ..... 842
Heater, Orchard, Burns Carbon Briquettes .. 368
Heater, Rugged Electrical, Has Many Uses. 594
Heater, Tar, Ignites Wood through Sand .... 921
Heater, Wheelbarrow, for Repairing Roads 535
Heaters, Electric, Strapped to Sides of Tank 538
Heaters Prevent Frost in Oxygen Cylinders. 391
Heating System, Central, for Orange Groves, by C. R. Baldwin ..... 499
Hedge Trimming Machine, One Man ..... 9
Heels, Detachable Rubber, for Slippers ..... 606
Helicopter, Man Carrying, Makes Short Flight ..... 181
Herb, Paraguayon, Sweetening Qualities of. 768
Herr, Fred A.:
Oil Well Fire, Dynamite Used to Blow Out 828
Oil Well, Master Bushing in, Recovered by "Human Gopher" ..... 329
Hide Market, Trapper's Roadside, Monopolizes Profits ..... 232
Hides, Walrus, Valuable for Polishing Metal 830
Highway, Auto, from Juarez to Mexico City being Promoted ..... 684
Highway, Formal Opening of, 200 Autos at Green Bay, Wis., Enter ..... 931
Highway, Lincoln, Municipal Auto Camp Sites Along ..... 182
Highway, Lincoln, Unsightly Trimmed Trees on ..... 14
Highway Maintenance Truck Has Complete Equipment ..... 102
Highway Models for Engineering College, by S. R. Winters ..... 907
Highway, Nebraska, Penetrates Famous Wilderness ..... 577
Highway, Storm King Mountain, Ready for Auto Traffic ..... 715
Highway Telephones, Free, to Aid Motorists 425
Highways, Motor, Honduras Now Building. 663
Hindu Tamil Procession, Gorgeous, in Ceylon ..... 873
Hinge Patterns, Making from Dry Sand Cores ..... 948
Hinges, Small, How to Make ..... 323
Historical Essay Prize Awarded ..... 983
Hobs, Recently Developed, for Cutting Sprocket Teeth ..... 44
Hoe Cleaner, Novel ..... 162
Hoe, Edging Tool for Lawns Made from ..... 321
Hog, Poland China, Monument Records Origin of ..... 599
Hogg, John Edwin:
Rattlesnake Etiquette for Tourists and Campers ..... 197
Hogs Thrive on Cat Tail Growths ..... 4
Hoist, Auto, Lifts Cars in Air ..... 735
Hoist, Combination Electric, and Overhead Conveyor ..... 24
Hoist, Garage Wall Fixtures Substituted for 947
Hoist, Hand, Electric Machine Hung on Its Chain to Operate ..... 235
Hoist, Hydraulic Shop, How to Make ..... 959
Hoist, Practical Homemade, for Garages .... 287
Hoist, Ratchetless, How to Make ..... 625
Hoist, Simple Boat, How to Make ..... 148
Hoist, Tire Press Bracket, Saves Time and Labor ..... 37
Hoisting Carriage, Ice, with Automatic Action ..... 248
Hoisting Gear for Shop or Farm ..... 645
Hoisting Winch, Anchor, for Seaplanes Tested by Navy ..... 896
Holdcroft, J. B.:
River Made to Pursue Prescribed Course .. 754
Holder, Adjustable Saxophone, Is Self Supporting ..... 122
Holder, Card, for One Armed Players ..... 442
Holder, Check Book Stub, Leaves Both Hands Free ..... 61
Holder, Convenient Flyhook, Made of Brass Spring ..... 72
Holder, Double Welding Rod ..... 136
Holder, Drill, Has Gauge for Rapid Measurement ..... 611
Holder, Flower Display, Fits Any Size Pot .. 730
Holder for Handling Hot Rivets ..... 949
Holder for Protecting Cutting Tools ..... 126
Holder for Short Nails ..... 619
Holder for Typewriter Eraser ..... 322
Holder, Fruit Jar, Has Flexible Band for Removing Top ..... 607
Holder, Goblet, for China Closet Saves Space 162
Holder, Ice Cream Cone, Made of Pasteboard 558
Holder, Ice Pick ..... 486
Holder, Machine Wrench ..... 962
Holder, Pencil, Made from Paper ..... 465
Holder, Reamer, to Produce Accurate Reaming ..... 584
Holder, Toothbrush, also Holds Paste ..... 279
Holder, Toy, for Baby's Chair ..... 278
Hole Leakage, Suck, Stopping in Rock Filled Dams ..... 86
Holes, Alining in Castellated Nuts ..... 949
Holes, Bored, Tool for Polishing ..... 304
Holes, Drilling in Glass ..... 147
Holes, Marking for Drilling ..... 962
Holes, Pin, Transferring in Shafts ..... 618
Hollingsworth, F. N.:
Archaeological Explorer, Work of ..... 595
Holmes, Fred L.:
Newspapers, Old, Reusing for Printing .... 685
Holster, Fire Extinguisher, for Watchmen .. 302
Home of President Monroe to be Restored .. 902
Home, Replica of Robert Burns', at Atlanta, Ga. ..... 930
Homes, Shortage of, Serious in Rome ..... 843
Hood Attachment, Auto, Prevents Rattling .. 608
Hook, Automatic Grab, for Fishing ..... 180
Hook, Brush, Made from Old Saw ..... 818
Hook, Clothes, for Bedstead ..... 315
Hook, Electric Lamp, Handy ..... 817
Hook, Fish, Binding to Leader for Salt Water ..... 162
Hook, Hay, Staples Pulled with ..... 452
Horn, Double, for Autos ..... 641
Horn, Hand Operated, Displaces Whistle .... 441
Horns, Cows', Lamp Made of, Gives Mellow Glow ..... 604
Horse, Huge, Made of Paper Mâché for Convention ..... 229
Horse Saved by Clamshell Crane ..... 16
Horse, Sea, Is Latest Bathing Beach Fad ... 409
Horse, Weakened, Supporting Rig for ..... 432
Horse "Winchester," Gen. Sheridan's, Moved to Washington, D. C ..... 581
Horses, Army, Fed Canned Oats Successfully 80
Horses, Farm, Breaking Still a Big Business, by Florence L. Clark ..... 249
Horses, Fire, Make Last Run as Feature of Parade ..... 35
Horseshoe Pitching Arena Has Twenty Courts ..... 605
Horseshoe Pitching Tournament, Annual ... 491
Horseshoes, Copper, Help Prevent Forest Fires ..... 430
Hose Clamp, Universal ..... 487
Hose, Garden, as Substitute for Spray Pump 318
Hose Roller Clamp Replaces Reel ..... 736
Hose, Silk, "Runs" in, Liquid Preparation for Stopping ..... 733
Hose Stream, Danger in Directing, on Charged Wires ..... 138
Hospital Appliances:
Crutch, Rolling, with Chair for Invalids .. 5
Drug Dissolving Appliance, Electrically Heated ..... 22
Garment, Patient's, Made Easy to Remove 40
Microbe Mincing Machine ..... 697
Protective Material, New, for Radiological Work ..... 498
X-Ray Equipment Improved for Medical Use ..... 891
Hospital, Floating, Treats Foot Troubles .... 392
Hospital, Junior Red Cross, for Children Opened at Calgary, Alberta ..... 170
Hospital, New York's $10,000,000, by Charles Martel Niles ..... 421
Hospital, Reconstruction, to be Enlarged ... 540
Hospital Rest Hour Signs to Warn Motorists ..... 110
Hot Plate, Electric, for Heating and Toasting ..... 606
Hot Plate, Electric, Has Disks for Catching Crumbs and Drippings ..... 771
Hot Water Bag, Instant Heat Chemical Bag as ..... 94
Hotel Business Promoting Ideas, Prizes Offered for ..... 655
Hotel Fire Demonstrates Worth of Concrete 211
Hotel Furnishes Free Taxi for Luncheon Guests ..... 232
Hotel Moved to New Site, 120 Feet Distant .. 547

Houk, Ivan E.:
River Channel, Remodeling..... 230
Town Moves Itself at a Profit..... 339
House, Apartment, Dynamited to Prevent Accidents ..... 836
House, Artistic, for Pigeons..... 407
House, Bird, Artistic and Elaborate..... 400
House, Boy Club, Built in Tree..... 449
House Built Single Handed by Inexperienced Man ..... 566
House—Bungalow, Little, Won by Girl for Prize Winning Essay..... 285
House, Concrete, Gives Touch of Fairyland. 926
House Decorations, Interior, of Fiji Islanders 22
House, Miniature, Lumber Truck Cab Resembles ..... 269
House of President Monroe to be Restored. 902
House, Old Block, on River "Point," Penn.. 602
House, One Room, for Kindergarten Pupils 110
House—Playhouse Has Convertible Furniture ..... 284
House, Queer, Sea Furnishes Material for.. 222
House, Replica of Robert Burns', at Atlanta, Ga. ..... 930
House, Small Play, Designed by Girl..... 121
House, Two Old Lighthouses Used in Building ..... 908
House, Two Story, on Stilts Has Elevated Basement ..... 76
Houseboat for Cotton Mill Employes..... 881
Household Devices....114, 278, 442, 606, 770, 934
Houses, Adobe, Long in Ruins Remodeled... 753
Houses — Bungalows, Attractive, to House Bee Families ..... 344
Houses, Eighty, Moved by Motor Truck Trailer 11 Miles..... 759
Houses, Shortage of, Serious in Rome..... 843
Housing Plan, New, Combines Luxury and Low Rents ..... 426
Howe, Frank B.:
Concrete Lumber, Two Types of..... 100
Humidifier and Deodorizer in Miniature Fountain ..... 822
Humming Bird in Nest with Young..... 776
Hunting Areas, Public, Canada Increases... 896
Hurdy Gurdy, New York, Motor Truck Wireless Displaces ..... 5
Hutchinson, W. I.:
Tree Seeds Live through Forest Fires.... 901
Hydrants Made Conspicuous by Painting Them Yellow ..... 282
Hydroelectric Plant and Logging Camp in Miniature ..... 918
Hydroelectric Plant, Picturesque, in France, by Allen P. Child..... 923
Hydroelectric Power Plant Design Increases Efficiency ..... 526
Hydroelectric Power Plant, Muscle Shoals, by R. C. Folger..... 670
Hydroelectric Power, Utilizing Humber River for ..... 758
Hydroelectric Project, Alpine Lakes to Form Link in ..... 575
Hydrogen Gas, Escaping, Discover Cause of Ignition of ..... 22
Hydroglider, Speedy French, Resembles Huge Fish ..... 333
Hydrogliders with Surface Propellers..... 837
Hydrometer, Simple, Batteries Quickly Tested with ..... 194
Hydrostatic Apparatus, New, Tests Concrete Pipes ..... 6

I. W. W., Good Work by, by H. H. Windsor 209
Ice Boat, Air Propelled, with Motor Bus Body ..... 271
Ice Box, Device Saves Ice in..... 967
Ice Box, Electric Lights for..... 489
Ice Box, Scale and Meter Measure Ice in... 392
Ice Carrier, Simple Convenient, for Motorists ..... 119
Ice Cream Bricks, Individual, Device for Making ..... 434
Ice Cream Cone Holder, Pasteboard..... 558
Ice Cream Confections, Simple Device for Making ..... 594
Ice Cream Freezer, Metal, Quick Freezing.. 770
Ice Cream Machine Cuts Eight Bricks at a Time ..... 192
Ice Cream Sandwiches, Outfit for Vending.. 382
Ice Harvest, Old Auto Engine Aids..... 351
Ice Hoisting Carriage with Automatic Action ..... 248
Ice Machine, Hand Operated, for the Home.. 583
Ice Pick, Holder for..... 486
Ice, Power Operated Saw for Cutting..... 862
Ice, Pure, Manufactured Economically in Alps ..... 775
Ice Sled, Air Propelled, to Carry Passengers and Freight ..... 563
Icebergs, Coast Guard Cutter Passes between ..... 76
Identification Cards, Protecting..... 312
Idols, Queer, Brought Back by Missionary.. 874
Illumination, Brazilian Exposition, Spectacular ..... 496
Impact Device Records Rough Handling of Railroad Cars ..... 80
Impact Machine Tests Road Construction... 216
Improvements, Civic, Chicago's Plan of, by Cleveland Gaines ..... 19
Incinerator, Camp Site, Homemade..... 809
Incinerators, Perambulating, in California Vineyards ..... 708
Incubator, Electric ..... 832
Incubator, Electric, Turns All Eggs at Once 280
Independence for the Philippines, by H. H. Windsor ..... 359
Index Centers, Grinding Miller..... 140
Index File for Brief Case..... 474
Indian Blanket Represents Strange Tribal Legend ..... 261
Indian Participates in Bridge Dedication Ceremonies ..... 509
Indians, Pacific Coast, Fighting to Retain Ancient Rights, by Francis Dickie..... 87
Indicator, Automobile, Makes Gear Changes Noiseless ..... 227
Indicator, Lookout Direction, for Use on Ships ..... 64
Indicator, Shaper and Drill Press..... 797
Indicator, Test, Attachment Increases Usefulness of ..... 463
Indicator, Water Level, for Auto Radiator... 277
Indicators, Lathe, for Testing Work..... 959
Industry, Art in, by H. H. Windsor..... 31
Injuries, Extensive Safety Campaign to Reduce ..... 353
Inner Tubes, Air Release for..... 315
Inner Tubes, Mittens for Handling Brick Made from ..... 640
Inner Tubes, Vulcanizing Attachment for.. 792
Insects, Bug Catcher Lures with Bright Lights ..... 206
Insects:
Mosquitoes, Drains Sprayed with Asphalt to Control ..... 356
Moths, European, Invade U. S. Trees..... 350
Inspectors, Micrometer Caliper Gauge for.. 53
Instruction Unit, Automobile, for Teaching Owners of Cars..... 230
Insulator for Wireless Antenna..... 312
Intensifiers, Automobile Spark, Explanation of ..... 325
Interrupter, Neat Wireless, How to Make... 976
Interurban Semaphore Operated by Public.. 85
Invalid, Children's Toy Vehicle Used by..... 830
Invalid Walking Chair Better Than Crutches 248
Invalids, Rolling Crutch with Chair for..... 5
Inventor—Alexander Graham Bell, Death of 529
Investments, Safe, Stock Exchange Playlet Instructs ..... 655
Iodine Pen, Antiseptic, Has Ready Supply.. 44
Iron Bars, How to Twist..... 128
Iron, Cast, Soda and Water as Lubricant for Broaching ..... 298
Iron Castings, Cleaning Scale from..... 455
Iron, Electric, Has Comfortable Grip Handle 607
Iron, Electric, Made in Complete Sections... 246
Iron, Recovering from Low Grade Ore, by Earl Christmas ..... 713
Iron Resources to be Developed by Steel Plant in Africa..... 94
Ironer, Electric, Makes "Ironing Day" a Pleasure ..... 527
Irrigation Canal, Débris Remover for..... 394
Irrigation Dam, Novel Method of Building, by O. Johnson..... 762
Irrigation Ditches Menaced by Beavers..... 224
Irrigation, Windmills on Columbia River for 888
Island, Easter, Proves Mysterious, by Francis Dickie ..... 833
Island, Star, Dedicated Exclusively to Religion ..... 539
Islands — Philippines, Independence for, by H. H. Windsor..... 359
Ivory, Removing Stains on..... 620

Jack Head, Auto, Saves Blocking Car..... 484
Jack, Homemade, Quick Acting..... 791
Jack, New Railroad Journal, Is Simple and Compact ..... 432
Jack, Pump, Three Speed Automatic..... 774
Jacks, Auto, Blocks for..... 487
Jacks, Auto Supporting, Add to Life of Tires ..... 743
Japanese Battle Accouterments, Ancient, Presented to Vanderbilt University, Tenn. 111
Jar Cap, Slotted, Aids in Opening..... 443
Jar Caps, Tight, How to Loosen..... 472
Jar Holder, Flexible Band, for Removing Top ..... 607
Jars, Preventing from Cracking While Canning ..... 485
Jaws, Removable, for Machine Vises..... 626
Jewelers, Electric Soldering Machine for.... 830
Jewelers, Flexible Shaft Outfit for..... 898
Jewelry, Simple Device for Washing..... 944
Jewelry:
Pearls, Artificial, How to Make..... 806
Watch, Tiny, May be Used as Cuff Link.. 606
Jewels, Russian Crown, Have Fabulous Worth ..... 984
Jig for Drilling Ball Handles..... 305
Jig Saw, Motor Driven, How to Make..... 950
Jinrikisha, Prince of Wales Pulls in Japan. 187
Johnson, O.:
Irrigation Dam, Novel Method of Building 762
Joints, Invisible Molding, How to Make..... 786
Joints, Screw Pipe, Making Tight..... 949
Jones, Ernest:
Airship Mooring Mast, New Navy..... 692
Journal Jack, New Railroad, Is Simple and Compact ..... 432
Jump, Record Parachute, More Than Four Miles ..... 184
Junk, Chinese, Adventurer Crosses Pacific in 822

Kaoliang Bran Utilized in Dye Manufacture 97
Kapok Fiber, Textile Industry Trying to Spin ..... 752
Keg, Tumbler Made from..... 301
Kerosene as Lubricant for Milling Aluminum ..... 135
Kettle Cover, Extra Water Heated in..... 716
Kettledrum, Device Changes to Musical Instrument ..... 91
Keyways, Template for Laying out..... 298
Keyseating Fixture for Use on the Shaper Head ..... 783
Keyseats, Cutting in the Shaper..... 628
Kiddie Car, New, Has Clever Drive..... 353
Kiddie Scooter, Spring Seat, Has Roller Skate Wheels ..... 448
Kiln Air, Circulation of, Shown by Acid Fumes ..... 890
Kiln Drying Process, Speed, Improves Lumber ..... 548
Kilns, Rotary Cement, Cleaned with Shotgun 737
Kindling Wood, Newspapers Used as..... 153
Kitchen Cabinet, Compact, for Small Space.. 443
Kitchen Cabinet, Convenient, Has New Features ..... 852
Kitchen Utensils:
Bake Pot with Pans for Placing Over Gas Flame Stove ..... 606
Broom Handle Made Tubular Instead of Solid ..... 8
Cake Baker, Glass, Has Hole in the Middle ..... 443
Chopping Dish, Glass, for Onions..... 442
Coffee Percolator, Electric, Is Self-Pouring 282
Coffee Pot, China, Has Removable Double Dripping Plates ..... 278
Cooking Utensil Cover Heats Extra Water 716
Corn Popper, Rotary, for Home Use..... 186
Cream Whipper, Electric, Saves Labor... 771
Crumb Tray with Roller Gathers Crumbs When Pushed ..... 279
Deodorizer, Refrigerator, Absorbs Meat and Vegetable Odors ..... 115
Dishwasher Uses Atmospheric Pressure.. 373
Egg Slicer for Salads and Fancy Dishes.. 442
Electric Stove for Toast, Coffee, and Frying ..... 279
Faucet Water Motor for Kitchen Use..... 279
Fish Scaler, Currycomb as..... 160
Food Dish, Heat Retaining, Uses Vacuum Principle ..... 935
Fruit Jar Cap, Slotted, Aids in Opening... 443
Fruit Jar Holder, Flexible Band, for Removing Top ..... 607

Kitchen Utensils: (Continued)
Fruit Strainer Eliminates Stained Hands. 442
Frying Pan, Electric, Made of Heavy Spun Steel ..... 771
Frying Pan Turns Eggs by Quick Jerk.. 279
Glasses, Brush Machine Quickly Cleans.. 228
Heater, Electric, Also Used as Toaster.... 935
Heater, Electric, for Boiling Clothes in Wash Tubs ..... 935
Hot Plate, Electric, for Coffee, Toast, and Warming Milk ..... 606
Hot Plate, Electric, Has Disks for Catching Crumbs and Drippings..... 771
Ice Cream Freezer, Metal, Quick Freezing 770
Ice Pick Holder..... 486
Kitchen Cabinet, Compact..... 443
Kitchen Cabinet, Convenient, Has New Features ..... 852
Knife and Scissor Sharpener..... 443
Milk Box, Sanitary, for Placing on Wall of Porch ..... 114
Mop, Self-Wringing, Keeps Hands Dry.. 115
Pantry Cabinet, Ventilated Sanitary..... 606
Pie Pan, Aluminum, Has Rim for Catching Juice ..... 114
Refrigerator, Small Portable, Is Insulated Against Heat ..... 114
Salt Shaker, Glass, Has Blades Inside for Cutting Lumps ..... 442
Scraper, Steel, and Brush for Pots and Pans ..... 278
Slicer, Sweet Corn, Has Adjustable Blade 934
Slicer, Vegetable and Fruit, Cuts Any Thickness ..... 935
Soap Dish for Hanging on Scrubbing Pail 606
Socket Attachment Accommodates Two Electrical Utensils ..... 771
Spoon and Fork Combination..... 607
Sprayer, Bottle, for Many Household Uses 115
Strainer Funnel Has Adjustable Screens.. 771
Tea Set, Iridescent Glass, Resists Heat and Cold ..... 115
Teakettle, Aluminum, Has Separate Hole for Filling ..... 934
Teakettle, Safety Vent for..... 153
Toaster, Electric, Turns Both Slices at Once ..... 607
Window Brush Has Compartment for Water ..... 771
Kitchen Ventilating Fan Easily Installed.. 576
Kites, Seaplanes Equipped with, to Carry Wireless Antenna ..... 96
Knee Control, Artificial, Practically Self-Locking ..... 242
Knife and Scissor Sharpener, Simple..... 443
Knife, Fabric, for Tire Repairmen..... 947
Knife for Cutting Sheet Metal..... 617
Knife, Sweet Corn, Has Adjustable Blade... 934
Knobs, Wireless, Made from Storage Battery Plugs ..... 642
Knot for Wiring Electrical Fixtures..... 619

Labor, Oriental Rice Farm, becoming Harder, by Lawrence Wm. Pedrose..... 255
Laboratory, Finest and Best Equipped, being Erected at Minneapolis..... 398
Lacquers, Use of ..... 646
Ladder Extension, Safe, How to Make..... 141
Ladder Foot Cannot Slip or Injure Floor.... 932
Ladder, Safety Folding, Cannot Collapse.... 442
Ladle, Babbitt, Made from Wagon Skein.... 465
Lake Level Not Parallel with Sea Level..... 74
Lakes, Uncharted, Airplane Aids in Locating 554
Lambs, Orphaned, Cow Nurses..... 776
Lamp, Adjustable Floor, for Garage and Shop ..... 514
Lamp, Auto Parking, Neat..... 400
Lamp, Auto Trouble, Installing under Dash. 154
Lamp Burners, Tire Pump Used for Blowing 624
Lamp, Electric, Adjustable as Table, Desk, or Wall Light ..... 770
Lamp, Electric Boudoir, Has Six Intensities of Light ..... 114
Lamp, Electric, Handy Hook for..... 817
Lamp Filaments, Double Electric, Have Longer Life ..... 234
Lamp, Incandescent, Is Largest in World, by Bernard G. Priestley..... 841
Lamp Made of Cows' Horns Gives Mellow Glow ..... 604
Lamp, Mercury Vapor Arc, Self-Starting.... 182
Lamp, Ornamental Cardboard, Can be Folded Flat ..... 210
Lamp Post on Porch to Guide Visitors..... 602

Lamp, Reading, Made from Music Rack.... 809
Lamp, Small Driveway, Shields Against Glare ..... 558
Lamp, Table, Wireless Receiving Apparatus Resembles ..... 177
Lamp, Traveling, Illuminates Lathe Work.. 867
Lamp, Tungsten Arc, Has One Point Light.. 58
Landing Field Indicator, Luminous, Aids Night Flying ..... 864
Landing Gear, Airplane, Dropped in Flight. 695
Lane, D. R.:
Shipyard, Idle, Adapted to Undo Own Work ..... 740
Lane, H. A.:
Floodlights on Trains ..... 514
Motion Pictures, Light Talks for..... 334
Typewriting by Wireless ..... 689
Wireless Station, Private, Well Equipped 662
Language Study on the Phonograph..... 147
Lantern Made from Old Can by Boys in Asia Minor ..... 878
Lantern, Trainmen's Signal, Carries Oil in Handle ..... 852
Lathe Arbor, Drill Used as..... 304
Lathe Center Driver ..... 464
Lathe, Cylinder Grinding Machine Attachable to ..... 44
Lathe Finishing Tool, Double Faced..... 626
Lathe Grinder Guard ..... 453
Lathe Indicators for Testing Work..... 959
Lathe, Six Inch Turret, How to Build..... 129
Lathe, Small, Spring Dog for..... 289
Lathe, Small Wood Turning, Chip Cleaner for ..... 962
Lathe, Speed, Supporting Long Metal Bars in ..... 782
Lathe Spindle Made from Pin Vise..... 300
Lathe Tailstocks, Expansion Relieving Center for ..... 282
Lathe Thread Cutting Device..... 853
Lathe Tools, Gauge for Setting..... 619
Lathe Turret Held in Tailstock..... 956
Lathe Used to Saw Logs..... 471
Lathe, Winch Improvised from..... 290
Lathe Work, Traveling Lamp Illuminates... 867
Lather, Ready Supply, Shaving Accessory Holds ..... 770
Lathes and Millers, Cylinder Grinder for... 592
Launch, Commodious River, of Famous Surgeon ..... 352
Laundry Appliances:
Clothes Prop, Collapsible, How to Make.. 978
Clothesline Outfit, Pulley, Is Motor Driven 939
Electric Iron Has Comfortable Grip Handle ..... 607
Electric Ironer Makes "Ironing Day" a Pleasure ..... 527
Heater, Electric, Boils Clothes in Tub... 935
Mechanical Handling Devices Adopted by Laundry ..... 228
Rack, Assorting, for Rough Dry Work.... 429
Wash Boiler, Faucet on, Aids in Emptying 490
Wash Boiler Rack, Wire, Removes Clothes Easily ..... 443
Washing Machine Driven by Engine in Detached Building ..... 641
Washing Machine Sterilizes and Bleaches Clothes ..... 935
Laundry Cabinet, Homemade Handy ..... 484
Law, Illinois Zoning, Made Void by Court Decision ..... 568
Lawn Checkers, Squares of Grass Used in.. 250
Lawn Edger Made from Shovel..... 153
Lawn Edging Machine Trims Sod from Sidewalk Border ..... 832
Lawn Mower Attachment for Cutting High Grass ..... 144
Lawn Mower Driver Shielded from Stray Golf Balls ..... 593
Lawn Mower Handle, Extension..... 315
Lawn Mower, Motor Driven, Also Rolls..... 56
Lawn Mowers, Three, Grass Cutting Machine with ..... 269
Lawn Set Has Checkered Cushion, Footstool, Table and Chair Cover..... 607
Lawn Sprinkler, Perforated Pipe..... 468
Lawn Vase, Stove Firepot as..... 156
Lawns, Concrete Blocks for Protecting.... 161
Lawns, Cutting in Dry Weather..... 317
Lawns, Edging Tool for..... 321
Lead Welding Outfit for Storage Battery Work ..... 542
Leakage, Suck Hole, Stopping in Rock Filled Dams ..... 86
Leash, Safety Dog, for Automobile..... 315
Leather Belts, Dressing and Cleaning..... 784
Leather Bound Books, Care of..... 810
Leather, Mildew on ..... 639
Leather, Soiled, Cleaning ..... 481
Leather—Walrus Hides Valuable for Polishing Metal ..... 830
Leaves, Extra Table, Storing..... 642
Leaves, Improved Rake for..... 647
Leg, Auxiliary Caliper ..... 128
Legion Men Lodged on Trains at New Orleans ..... 876
Lenses, Instrument Measures, by Light Waves ..... 700
Lepers, What About, by H. H. Windsor..... 360
Letter, Russian, Stamps on, Worth 200,000 Rubles ..... 394
Letters, Nationality and Registry, for Air-Craft ..... 358
Levee, Solid Core Wall Prevents Undermining of ..... 416
Level for Tapered Masonry..... 791
Levingston, David H.:
Mine, Rock Salt, a Visit to..... 411
Liaison System, Prizes for Best, between Artillery and Infantry ..... 655
Libretto, Prize Winning, Now Ready for Composers ..... 655
License Bars, Auto, as Thief Signal..... 598
Lie Detector Aids Police, by John Anson Ford ..... 869
Life Saver, Hazards of, and Incidents of His Work ..... 258
Lifeboat, Large Motor, Has Cabin Accommodations ..... 62
Lifeboat, Motor, with Hospital Equipment. 191
Light Bowls, Keeping Insects from..... 802
Light Bulb, Incandescent, Is Largest in World, by Bernard G. Priestley..... 841
Light Filaments, Electric, How to Repair.. 161
Lights, High Power Portable, for Taking Motion Pictures ..... 48
Light Reflector, Novel Inverted..... 639
Light Talks for Motion Pictures, by H. A. Lane ..... 334
Lighter, Automatic Gas, for Typesetting Machines ..... 305, 983
Lighthouse Lights, Isolated, Clever Control Valve Made for ..... 351
Lighthouses, Two Old, Used in Building Cottage ..... 908
Lighting Fixture, Cheap Indirect..... 156
Lighting Fixture, Convertible, for Gas Burners ..... 330
Lighting Fixtures, Brass, Refinishing..... 796
Lighting Fixtures, Protecting While Using Vacuum Cleaner ..... 490
Lighting Plant, English, German Submarine Engines Drive ..... 263
Lighting Plants, Home, Engine Muffler for. 483
Lighting Principles, Suitcase Outfit Shows.. 239
Lighting System, Spectacular, at Brazilian Exposition ..... 496
Lighting Tubing, Steel, Comes Already Wired ..... 898
Lightning Bug's "Flashes" on Photographic Plate ..... 540
Lightning, Smokestack Specially Attracts.. 706
Lights, Bright, Bug Catcher Lures Insects with ..... 206
Lights, Exterior, to Illuminate Amphitheater 551
Lights, Flickering Subway, New Shoe Remedies ..... 437
Lights, Flood, on Trains, by H. A. Lane.... 514
Lights, Isolated, Clever Control Valve for.. 351
Lights, Street Signal, that Flash Red, White and Blue ..... 275
Lights, Yellow Tail, May Replace Red on Autos ..... 91
Lignite Fuel Carbonized at Reduced Cost... 899
Lime and Plaster Stains, Removing from Floors ..... 476
Lincoln Highway, Municipal Auto Camp Sites along ..... 182
Lincoln Memorial, Stately, Dedicated..... 2
Line Foreman, Spectacular Repair Task of.. 723
Linen Tester Has Pointer for Counting Threads ..... 831
Links, Expanding Cuff, Permits Sleeves to be Pushed Up ..... 443
Linotype Slug Adjuster Has Antifriction Roller ..... 609
Linseed Oil, Miscellaneous Uses for..... 468
Lip Protector, Dental, Aids Operator and Patient ..... 521

Liquids, Direct Reading Instrument Measures Flow of ..... 906
Literary Competitions, Quebec to Reward.. 655
Literature, Agency to Send, to Russian Scientists ..... 435
Literature and Kindred Arts, Excellence in, Medals Awarded for..... 820
Live Stock Loader, Substantial Portable.... 962
Lizard, Strange, Studied near a Dead Sea... 922
Loader, Air Blast, for Ear Corn..... 394
Loader, Live Stock, Substantial Portable... 962
Loader, Shock, Economical for Farmer.... 908
Loading Platforms, Street Car, in Los Angeles, Calif. ..... 602
Lock, Adjustable Steering Wheel, for Autos 4
Lock, Auto, Causes Fatal Accident..... 410
Lock, Auto, Closes Exhaust Passage..... 94
Lock, Auto, Displaces Transmission Case Cover ..... 432
Lock, Auto, Installed in Steering Wheel Hub ..... 354
Lock, Auto Wheel, Safeguards Tire Valve... 933
Lock, Convenient, for Garage Door..... 977
Lock for Steam Valves..... 946
Lock, Keyless Pad, Has Radium Dial Face.. 207
Lock, Latest Safety, Requires Two Keys.... 272
Lock Mortiser, Portable, Used on Door Jambs ..... 747
Lock, Motorcycle, Connected to Supporting Stand ..... 762
Lock—Padlock, Safe Type, Has Numbered Combinations ..... 444
Lock, Simple, for Drawer or Chest..... 644
Lock Strike Plate for Doors Easily Adjustable ..... 773
Lock, Truck Wheel, How to Make..... 964
Locomotive Coal Shovel, Automatic Counters on ..... 66
Locomotive Exhaust Steam Saves Coal..... 189
Locomotive, How Far Can It Jump? by Francis W. Wilson ..... 674
Locomotive, Most Efficient and Powerful... 187
Locomotive Piston Heads, Renewing..... 616
Locomotive Sand Boxes, Improvement in... 117
Locomotive Sheds, Italian, with Asbestos Roofing ..... 429
Locomotive, Small Tractor Changed into.... 256
Locomotive Turntable 100 Feet Long..... 280
Locomotives, Export, Floating Crane Unloads ..... 867
Locomotives, Powerful, Used in Switzerland 858
Locomotives, Swedish, Ready for Delivery to Russia ..... 49
Locomotives, Train of, Half Mile Long..... 165
Lodge — Knight Templar, Huge Mounted, Erected at New Orleans..... 229
Lodge Temple, Masonic, Built by Its Members ..... 178
Log, Hollowed, Phonograph Cabinet Made from ..... 500
Log Rolling—"King of the White Water"... 657
Logging Camp and Power Plant in Miniature ..... 918
Logging Wheel, All Steel, for Tractor Use.. 578
Logs, Continuous Tread Traction System for Hauling ..... 79
Logs, Lathe Used to Saw..... 471
Loom, Cotton Goods, Operated by Wireless. 892
Loom, Improved, for Beadwork..... 795
Loom Shuttle, Blasts of Compressed Air Replaces ..... 677
Looms, Cotton, Vacuum Cleaners Used on.. 941
Loud Talker, High Voltage, for Wireless Needs No Batteries ..... 500
Loud Talker, Wireless, How to Make..... 805
Loud Talker, Wireless, Nonvibrating Material Used in ..... 182
Loud Talker, Wireless, Phonograph Used as. 450
Lovett, Everett J.:
Theater Foundation, New, Placed While Players Perform ..... 25
Volcano, Active, Drilling Holes in..... 183
Lubrication Testing of Light Auto..... 642
Lubricators, Pump, Preventing Leakage through ..... 306
Lumber Barge Has Cargo Strewn on Beach by Storm ..... 732
Lumber Camp, Oregon, Boasts Longest Wireless Antenna ..... 530
Lumber, Concrete, Two Types of, by Frank B. Howe ..... 100
Lumber Correspondence Course ..... 333
Lumber Kiln Air, Circulation of, Shown by Acid Fumes ..... 890
Lumber, Saving of By-Products Improves.. 405
Lumber, Speed Kiln Drying Process Improves ..... 548
Lumber Truck Cab Resembles Miniature House ..... 269
Lunch Box and Table, Folding, for Motorists 476
Lunch Box, Cylindrical, Used as Extra Auto Seat ..... 608
Luncheon Guests, Hotel Furnishes Free Taxi to ..... 232

Mac Mechen, E. C.:
Tunnel, Long, to Pierce Continental Divide ..... 361
Machine Gun, Antibandit, in Demonstration, by Eric A. Dime ..... 41
Machine Gun Mounted on Boat for Killing Sea Lions ..... 906
Machine Operators, Group, Annunciators for 456
Machine Time Calculated on Special Sliderule ..... 269
Magazine Rack, Homemade ..... 641
Magazine Rack on Park Tree for Use of Public ..... 766
Magazine Trimmer, Improved Continuous.. 508
Magazines, Discarded, Thrown in Boxes for the Poor ..... 766
Magician's Rights Recognized, by H. H. Windsor ..... 703
Magneto Driving Pulleys for Testing..... 628
Magnets, Magneto, Used as Clamps..... 634
Magnifying Glass Contained in Neat Paper Weight ..... 107
Magnifying Runner for Sliderules..... 301
Mail Airplanes, Efficient Service of..... 722
Mail Box That Is Always Locked..... 310
Mail, Handling of, "Picked Up" Table Speeds ..... 726
Mail Pouch, Small, for Mailing Souvenir Cards ..... 775
Mail Tubes, Pneumatic, in New York to be Reopened ..... 878
Mailmen, Hand Operated Horn for..... 441
Mallet, Rubber Auto, Saves Tire and Rim.. 717
Man, America's Largest, Takes Airplane Spin 820
Man, Excessive Voltage of Electric Alarm Kills ..... 96
Man, Strong, Supports Eight Men and Framework ..... 345
Manhole Cover, New, Has Reversible Flange 594
Manifolding Aid for Typists..... 639
Manometer, Multiple, Airplane Pressures Recorded by ..... 666
Manufactured Products, Art in, by H. H. Windsor ..... 31
Map, Aerial City, to be Made of New Orleans ..... 415
Map Holder, Motorcycle, Fastens to Handle-Bars ..... 358
Maps, Aerial, Efficient High Speed Camera for Making ..... 36
Maps, Aerial Tax Assessment, Convenient.. 208
Maps, Enlarging Quickly ..... 324
Maps, School Traffic, Guide Pupils through Building ..... 715
Marble Playing Tournament in Front of New York City Hall..... 448
"Marcel Week" to be Observed in France.. 983
Marker and Drill, Small, for Garden Use... 678
Market, Trapper's Roadside, Monopolizes Profits ..... 232
Marks, Nationality and Registry, for Air Craft ..... 358
Marshland, Italy to Drain, Unused for 2,500 Years ..... 910
Marshland, Novel Wheel Pump for Draining 597
Mason, F. H.:
Tramway, Far North, Has Longest Cable. 217
Match Box Holder and Lighter..... 802
Match Holder Fastens to Windshield by Vacuum ..... 710
Match Scratcher Can be Attached to Inside of Coat ..... 114
Mathematical Research Work, Prizes Offered for ..... 163
Matting, Rubber, Prevents Slipping on Polished Floors ..... 317
Maxwell, Edward G.:
Submarine Salvaged to Sink It..... 863
Meals, Warm, Tractor Hauls for Patients.. 84
Measuring Device, Electric, for Minute Dimensions ..... 604

Measuring Instrument, Mechanics', Has Wide Range of Uses ..... 773
Measuring Machine, Bench, of Extreme Precision ..... 847
Meat, Appelwood for Smoking ..... 477
Mechanics' Measuring Instrument Has Wide Range of Uses ..... 773
Medal, World's Fair, Old Curious Watch Wins ..... 18
Medical Advice, Free, Sent to Ships by Wireless ..... 932
Megaphone, Wireless, Is Also Diving Platform ..... 343
Melting Furnace, Gas Fired, Has Three Burners ..... 428
Memorial, Abraham Lincoln, Erected at Various County Seats ..... 580
Memorial Band Stand for War Veterans of Spilliville, Iowa ..... 275
Memorial, Drinking Fountain, Honors Church Worker, Morgan Park, Ill. ..... 602
Memorial, Forest Service Men Honored by .. 708
Memorial, Francis Scott Key, Dedicated .... 205
Memorial, George Washington Masonic National, by R. C. Folger ..... 518
Memorial Hall to be Built at Bloomington, Ill. ..... 277
Memorial—Home, Replica of Robert Burns', at Atlanta, Ga. ..... 930
Memorial, "Lusitania," to Float over Boat's Grave ..... 202
Memorial, Stately Lincoln, Dedicated ..... 2
Memorial to Mark Historic "Delaware Crossing" ..... 551
Memorial Tower in Honor of Lost Seamen .. 345
Memorial, War, Ornamental Church Window Is ..... 248
Memorials of Notable Historical Events and Personages ..... 580
Mercury Arc Rectifiers of Large Capacity ... 10
Merry-Go-Round, Safe, Makes Exercise a Joy ..... 774
Message Clearing House at New York Terminal ..... 562
Messengers, Brokerage, to be Made Conspicuous ..... 446
Metal—Brass, Hardened, Drawing Temper from ..... 948
Metal—Copper, Extraction from Low Grade Ores ..... 435
Metal—Iron, Recovering from Low Grade Ore, by Earl Christmas ..... 713
Metal—Iron Resources to be Developed by Steel Plant in Africa ..... 94
Metal, Sheet, Knife for Cutting ..... 617
Metal, Sheet, Perforated Business Signs Made of ..... 125
Metal Sheets, Thin, Machine Tests Workability of ..... 61
Metal—Steel, Rate of Heating, Has Effect When Hardening ..... 170
Metal Surfaces, Electric Scaling Tool for ... 6
Metal Wires, Drawn Fine, Composed of Single Crystal ..... 102
Metal, Workability of, Improved Tester Tells ..... 758
Meter, Auto Gradient, Mounted on Dash .... 747
Meter, Coal, Records Amount of Fuel Per Hour ..... 895
Meter, Direct Reading, Measures Flow of Fluids ..... 906
Meter, New Gas, Positive Blower Mechanism Basis of ..... 567
Meter Valve, Automatic Gas, Reduces Damage by Fire ..... 933
Microbes, Machine Minces for Use in Vaccine ..... 697
Microbiology, Eminent Work in, Prizes Offered for ..... 163
Micrometer Attachment for Measuring Tapers ..... 140
Micrometer Attachment, Quick Reading .... 617
Micrometer, Bench, of Extreme Precision ... 847
Micrometer Caliper Gauge for Inspectors ... 53
Micrometer Height Gauge ..... 456
Micrometer Tip, Auxiliary ..... 463
Microscope, Monster, to Aid in Detecting Criminals ..... 524
Midget, Tiny, Weighs 18 Pounds ..... 448
Mildew on Leather ..... 639
Milk Box, Sanitary, for Placing on Wall of Porch ..... 114
Milk Kept from Freezing by Two Lamps in Box ..... 215
Milk, Remade, Devise Test for Detecting Presence of ..... 78
Milk Sterilization Experiments to Kill Typhoid and Tuberculosis Germs ..... 548
Mill, Primitive Sugar Cane, Made of Wood 108
Mill, Small Sugar Cane, Large Water Wheel Drives ..... 65
Milling Cutters for Use on Wide Surfaces .. 460
Milling Machine Cutters, When Not Running True ..... 631
Milling Machine, How to Feed Work on ..... 289
Milling Machine Vises, Removable Jaws for 626
Milling, Steel, Oil should be Used Liberally When ..... 137
Mincing Machine for Microbes to be Used in Vaccine ..... 697
Mine Belt, Coal, to Carry Output through Long Tunnel ..... 544
Mine, Deep Brazilian, Needs Precooling of Air ..... 658
Mine Rescue Birds, Oxygen Cage for ..... 383
Mine Rescue Feats, Money Expended for Trophies for ..... 393
Mine Rescuing Apparatus, Complete, Cooperative Coal Mining Companies Have ..... 399
Mine, Rock Salt, Visiting, by David H. Livingston ..... 411
Mine Tramway, Far North, Has Longest Cable, by F. H. Mason ..... 217
Mineral—Molybdenite Found to Give "Photonegative" Reaction ..... 9
Minerals, Radioactive, Found in Italy ..... 941
Minerals, Radium Bearing, on Island of Madagascar ..... 66
Miners, Argonaut, Heroic Rescue Attempt by 682
Miner's Quartz Mill Easily Portable ..... 937
Mines, Fabric Ventilation Tubing for, Stands Severe Test ..... 170
Mining Tools Used to Strip Concrete Bank Vault ..... 64
Mirror Cleaning Bag Contains Granular Substance ..... 442
Mirror, Handy, for Camp Use ..... 317
Mirror, Watch Crystal ..... 148
Mirrors and Pictures, Device for Handling .. 584
Mirzaoff, A. N.:
Pictures, 92,000, Per Second ..... 541
Mittens, Rubber, for Handling Brick ..... 640
Mixer, Cheap Concrete, How to Make ..... 458
Mixer, Concrete, Has Two Wheels and Easily Portable ..... 558
Mixer, Tank, Stirs Contents with Vertical Motion ..... 598
Mocking Bird Imitates Clucking Hen ..... 611
Model Machinery, Connecting Rods for ..... 477
Mold, Adjustable, for Different Size Tires .. 734
Molding Joints, Invisible, How to Make .... 786
Molybdenite Found to Give "Photonegative" Reaction ..... 9
Money—Barter Trade in Germany as Medium of Exchange ..... 32
Money—Coin, Large Swedish Copper, Is Ancient Currency Relic ..... 270
Money—Coins, Holding in Envelope for Mailing ..... 311
Money—Coins, Old Gold, Unearthed ..... 174
Money—English Exchange, Table for Computing ..... 624
Monkey Cage, Zoo, Has Hospital and Modern Conveniences ..... 943
Monoplane, Army "Bus," Built on Foreign Lines ..... 410
Monument, Drinking Fountain, Symbolizes Army, Navy, and Marine Corps, Calif ... 581
Monument, First White Settler, at Bloomington, Illinois ..... 580
Monument, Forest Service Men Honored by 708
Monument, "Lusitania," to Float over Boat's Grave ..... 202
Monument Records Origin of Poland-China Hog ..... 599
Monument to First French Victim of Late War ..... 747
Monument to Mark Historic "Delaware Crossing" ..... 551
Monument, Verdun, Marks Heaviest Loss in the World War ..... 581
Monuments, Stately, Heroes of Revolution and Singer of Nation's Anthem Commemorated in ..... 204

Monuments, Two Great National, Air View of ..... 245
Mooring Mast, Airship, New Navy, by Ernest Jones ..... 692
Mop, Self-Wringing, Keeps Hands Dry..... 115
Morgan, Robert:
Ship Canal, Big, U. S. to Have Another.... 387
Mortar, Novel Method of Stringing, in Masonry Work ..... 344
Mortiser, Portable Lock, Used on Door Jambs ..... 747
Mosquitoes, Drains Sprayed with Asphalt to Control ..... 356
Moths, European, Invade U. S. Trees..... 350
Motion Picture Artist Name, Prizes Offered for ..... 819
Motion Picture Camera Also Takes Snapshots ..... 350
Motion Picture Camera, How to Make..... 969
Motion Picture Camera Records Vital Facts in Rail Demonstration, by Geo. F. Paul.. 236
Motion Picture Camera Tripod Head, Tilting 18
Motion Picture Camera Used to "Shoot" Eagle Family ..... 168
Motion Picture Comedy, Strong Man Lifts Truck in ..... 192
Motion Picture Dissolving Slide..... 288
Motion Picture Film, American Coal Mining, to be Shown Abroad ..... 432
Motion Picture Film, Government, Show Mountain Road Building Work in..... 208
Motion Picture Films, Industrial, to be Censored by Experts ..... 109
Motion Picture Machine, Homemade Toy.... 981
Motion Picture Projector for Schools and Homes ..... 725
Motion Pictures—Amateur Bedouins on the Warpath ..... 757
Motion Pictures and Photographs Broadcasted by Wireless ..... 824
Motion Pictures, Clean, Financial Organization to Produce ..... 938
Motion Pictures, Comedy, Freak Auto Body Built for ..... 65
Motion Pictures, High Power Portable Light for Taking ..... 48
Motion Pictures, Home, New Projector for Showing ..... 62
Motion Pictures, Light Talks for, by H. A. Lane ..... 334
Motion Pictures, Misframed, Film Rewinding Attachment Stops ..... 878
Motion Pictures, Speaking, Voices Registered on Film for ..... 83
Motor, Blowers on Armature of, Eliminates Heat and Dust ..... 906
Motor Bus Home, Showman's, Is Elaborate 257
Motor Bus, Large Capacity, Has Detachable Body ..... 391
Motor Bus Shower Bath Speeds Washing.. 430
Motor Busses Equipped with Wireless..... 169
Motor, Double Cylinder Air, Smaller than Match Box ..... 268
Motor, Electric, Attaching to Washing Machine ..... 318
Motor, Faucet Water, for Various Kitchen Duties ..... 279
Motor Lifeboat with Hospital Equipment.. 191
Motor, Low Waterhead, for Swift Current.. 678
Motor, Neat Rotary, Weighs Ten Pounds.. 402
Motor, Rebuilt Airplane, Systematically Tested ..... 920
Motor, Rowboat, Mounting in a Canoe..... 317
Motor, Squirrel Cage Induction, New Form of ..... 614
Motor Truck, First Commercial, to Use Wireless Equipment ..... 109
Motor Truck for Tourists Fully Equipped... 724
Motor Truck Hayrakes Function Efficiently 35
Motor Truck, Patriotically and Skillfully Adorned ..... 381
Motor Truck, Private Wireless Set Mounted on, by H. A. Lane ..... 662
Motor Truck Trailer Moves 80 Houses 11 Miles ..... 759
Motor Truck, Turntable for, Speeds Road Construction ..... 547
Motor Truck Wireless Displaces New York Hurdy-Gurdy ..... 5
Motor Trucks, Auxiliary Coil Springs for. 697
Motor Wheel as Home Shop Power Plant.. 799
Motorboat, Nonsinkable, Has Special Compartments ..... 106
Motorboat, Toy, Made from Boxes Wins Prize ..... 285
Motorcycle and Sidecar Converted into Light Auto ..... 847
Motorcycle, Broad Tired, for Desert Travel. 558
Motorcycle, Fire Fighting Unit Speeds on 92
Motorcycle Fleet Sweeps up Glass in Street 349
Motorcycle Lock Connected to Supporting Stand ..... 762
Motorcycle Map Holder Fastens to Handlebars ..... 358
Motorcycle, New, Two Sit Side by Side on.. 688
Motorcycle, Potato Plant Sprayer Mounted on ..... 226
Motorcycle Sidecar Police "Bandit Squad" at Philadelphia ..... 767
Motorcycle Sidecars Transport Welding Outfits in New Orleans ..... 931
Motorcycle Stand Simple and Easy to Operate ..... 717
Motorcycle Trailer, How to Make..... 785
Motorcycle, Windshield and Spotlights Fitted on ..... 503
Motorists, Camp for, in Seattle, Wash..... 603
Motorists, Eye Protection for..... 162
Motors, Airplane Liberty, Improved..... 774
Motors, Polyphase, Prevented from Single Phasing with Renewable Fuse ..... 772
Mountain Climbing, Risky, in Switzerland.. 568
Mountain—Mount Blanc Elevators, Resume Work on ..... 383
Mountain—Mount Everest Summit Still Untrod by Man, by Henry S. White..... 374
Mountain—Mount Hood, Looping, by S. Gertsmon ..... 559
Mountain Pass Has New Road Among Clouds ..... 494
Mountain Road Building Shown in Government Motion Picture Film..... 208
Mountain Road, Storm King, Ready for Auto Traffic ..... 715
Mountain, Stone, Fence Is Strange "Pipe Organ" Heard on ..... 900
Mountain, Tenderfoot, Spiral Drive on, by J. H. Freeman ..... 395
Mounting, Wireless Rheostat ..... 153
Mountings and Fan Coils for Wireless.... 498
Mousetrap Trips Camera Shutter..... 967
Mouthpiece, Cornet, No-Pressure Attachment to ..... 386
Mouthpiece, Telephone, Prevents Eavesdropping ..... 63
Moving Van, Patriotically and Skillfully Adorned ..... 381
Mower Attachment, Lawn, for Cutting High Grass ..... 144
Mower, Grass, Motor Driven, Also Rolls Lawn ..... 56
Mower Handle, Lawn, Extension..... 315
Mower Sickle Sections, How to Remove.... 324
Mowers, Four, Pulled by Gasoline Tractor.. 60
Mowers, Three, Grass Cutting Machine with ..... 269
Mowing Machine Driver Shielded from Stray Golf Balls ..... 593
Mucilage Spreader Utilizes Atmospheric Pressure ..... 830
Mud, Oil Well Drilling with..... 46
Mud Rim, Auto, Prevents Skidding..... 2
Muffle Furnace, Electric, How to Make..... 957
Muffler, Exhaust, Venturi Tube Principle Used in ..... 583
Muffler for Home Lighting Plants..... 483
Museum, National Engineering, Planned for Washington ..... 716
Museum, Odd, Records Voices of Distinguished Men ..... 214
Music Device Turns Leaves ..... 673
Music Rack Attachment Holds Instrument.. 310
Music Rack, Reading Lamp Made from.... 809
Music Roll Cabinet, Automatic..... 496
Music, Strange, from Fence on Stone Mountain ..... 900
Music—Symphonic Composition, Best, Prizes Offered for ..... 655
Musical Compositions, Prizes Offered for... 655
Musical Education, Scientific Methods Used in, by Henry S. White..... 172
Musical Instruments:
Banjo Bridge, Adjustable, and Clothing Guard ..... 691
Banjo Heads, Bracketless, Adjusted with One Key ..... 720

Musical Instruments: (Continued)
Banjo Strings Made Snappy by Extension Tailpiece ..... 119
Banjos, Nonslipping Tuning Peg for..... 936
Banjos, Nontipping Bridge for..... 936
Banjos, Peg for Strings of..... 722
Cornet Mouthpiece, No Pressure Attachment to ..... 386
Guitar, New Hawaiian, Rests on Player's Lap ..... 83
Hurdy Gurdy, Wireless on Truck Displaces ..... 5
Kettledrum, Device Changes to Musical Instrument ..... 91
Piano, Miniature Upright, with Pedal Keyboard ..... 40
Saxophone Holder, Adjustable, Is Self-Supporting ..... 122
Violin as Phonograph Reproducer..... 637
Violin Finger Board, Corrugated, Aids Players ..... 569
Violin, Mammoth, Is Feature of Music Conference ..... 196
Violin or Cane Interchangeable at Will.. 202
Violoncello, Collapsible, Is Portable and Quiet ..... 337

Nail, Driving End of, Made Self-Clinching.. 116
Nail Straightening Device Easy to Operate 752
Nails, Copper Steel Shingle, are Rust Resisting ..... 286
Nails, Driving to Prevent Splitting..... 454
Nails, Enameled Upholstering, Used to Make Flag ..... 431
Nails, Pinch Dogs Made from..... 470
Nails, Short, Holder for..... 619
Nails, Small, Device for Starting..... 302
Name for Reckless Auto Driver..... 428
Name, Oddity of, Made Advertising Slogan.. 450
Name, Prizes Offered for, to Replace "Silvore" ..... 655
Name, Screen Artist, Prizes Offered for..... 819
Narcotics, Action of, on Life..... 656
Navy—Destroyers, Maneuvers of, Necessary for Formation of Smoke Screens..... 536
Navy Torpedo Boats, Small Speedy..... 497
Necklaces, Pearl, Offered for Best Title for Picture ..... 983
Needle, Phonograph, Six Feet Long..... 694
Needle Valves, Carburetor, Repairing..... 638
Needlework, Many Kinds of, Prizes Offered for ..... 983
Negatives, Enlarged, How to Make..... 818
Nest, Humming Bird ..... 776
Net, Large Dip, Filipinos Use for Fishing.. 71
Net, New Hammock, Made like a Bag..... 400
Newspaper, Chinese, Typesetting a Big Task on ..... 246
Newspaper Postage Rate, Reduce, by H. H. Windsor ..... 209
Newspaper Prize for Building Design..... 327
Newspapers for Filling Cracks in Poultry Houses ..... 310
Newspapers, Old, Reusing for Printing, by Fred L. Holmes ..... 685
Newspapers, Using as Kindling Wood..... 153
Newsprint, Amount of, U. S. Uses Yearly.. 661
Nickelplating, Nickel Fluoride Best for.... 574
Niles, Charles Martel:
Hospital, $10,000,000, New York Is Building ..... 421
Novel by American Author, Prize Offered for 327
Novel, Historical, Prize Offered for Best Essay on ..... 491
Novelties, Attractive, Polished Coal Makes. 410
Numbering Stamp, Consecutive, Made from Dater ..... 640
Nut Locking Device, Quick..... 135
Nutcracker, Powerful, Is Easily Controlled. 400
Nuts, Castellated, Alining Holes in..... 949

Oars, Boat, Keeping in Rowlocks..... 481
Oats, Canned, Fed Army Horses Successfully 80
Observatory Grounds, Mount Wilson, in Miniature ..... 348
Observatory, Mount Wilson, Aerial Photograph of ..... 247
Occupational Prizes for "Shut-Ins" Offered by Popular Mechanics ..... 163
Office Appliances:
Binder, Mammoth Loose Leaf, Largest Ever Built ..... 79
Check Book Stub Holder Leaves Both Hands Free ..... 61
Office Appliances: (Continued)
Mucilage Spreader Utilizes Atmospheric Pressure ..... 830
Paper and Carbon Sheets, Cabinet Holds. 373
Paper Weight, Neat, Contains Magnifying Glass ..... 107
Pencil Sharpener Produced with Tool Steel Blades ..... 84
Stamp, Consecutive Numbering, Made from Dater ..... 640
Typewriter, Standard and Word Writing, Aids Speed ..... 166
Office Building to be Wired for Wireless... 492
Office, Salesman Opens, in Large Oil Tank.. 719
Oil, Better Quality, by Rapidly Condensing Vapors ..... 175
Oil Cup Inside of Spring Lubricates Valve Stem ..... 116
Oil Dilution, Crankcase, Automatic Device Removes ..... 99
Oil Dispensing System ..... 648
Oil Dropper for Oilstone..... 617
Oil Feed Pipe, Auto, Cleaning..... 796
Oil Fields, New, Portable Refinery for Use in, by Curtis Vinson..... 418
Oil Filling Can for Auto Engines..... 633
Oil Gauge, Handy, for Autos..... 968
Oil Grooves, Cutting in Pulleys..... 455
Oil Lands, Government, Yield Large Royalties ..... 913
Oil, Linseed, Miscellaneous Uses for..... 468
Oil Pipes, Submarine, from Wells to Ships at Sea ..... 34
Oil Pump Drive, Self-Thawing, for Old Model Autos ..... 544
Oil Pump Similar to Gasoline Curb Pump... 189
Oil Service Can for Garages..... 62
Oil Shales, Value of, Determined by Microscopic Examination ..... 273
Oil Tank, Salesman Opens Office in..... 719
Oil Tank Truck and Soda Fountain Combined ..... 61
Oil Tanker, Wrecked, Salvaged by Docking It Sideways ..... 555
Oil Tanks, Buried, Corrosion of..... 784
Oil Tanks, Large, Erected in New Zealand... 900
Oil Testing for Light Automobile..... 642
Oil, Using Liberally When Milling Steel..... 137
Oil Well Drill Bit Drills Hole and Takes a Core ..... 280
Oil Well Drilling, Mud Is Valuable Accessory in ..... 46
Oil Well Drilling, Spiral Stem Simplifies..... 232
Oil Well Fire, Dynamite Used to Blow Out, by Fred A. Herr..... 828
Oil Well, Master Bushing in, Recovered by "Human Gopher," by Fred A. Herr..... 329
Oil Wells and Ancient Cemetery Share Same Ground ..... 109
Oilcan, Leak Proof, for Motorists..... 446
Oilcan Spigot, Handy and Saving..... 147
Oiler, Handy Saw, for Bench..... 619
Oils, Seed, Amount of Seeds Produced in India for ..... 249
Oilstone, Oil Dropper for..... 617
Onion Chopping Dish, Glass, Protects Eyes.. 442
Opera—Libretto, Prize Winning, Now Ready for Composers ..... 655
Optician's Filter for Catching Powdered Glass ..... 435
Optician's Spraying System for Counter Use. 252
Orange Grove, 15 Acre, within City Limits of Anaheim, Calif. ..... 709
Orange Groves, Central Heating System for, by C. R. Baldwin..... 499
Orchard Heater Burns Carbon Briquettes... 368
Ore, Carnotite, Ruins Photographic Films... 404
Ores, Mixed Copper, Cheap Method of Treating ..... 192
Organ Pipes, Huge, Voiced Outside Factory. 398
Organist Seat, Divided, Makes Playing Easier ..... 66
Ornaments, Bathing Cap, How to Make..... 653
Oscilloscope, High Speed Machines Studied with ..... 728
Ovens, Electric Bake, Made in Sections..... 848
Overall Suit, Neat, Made in Two Pieces..... 905
Overalls, Economical, Made for Reversible Wear ..... 286
Oxfords, Leather Saddle Strap Converts into Sport Shoes ..... 935
Oxygen and Acetylene Tanks, Handling of.. 797
Oxygen Cylinders, Frost in, Prevented by Heaters ..... 391

Pack Cover and Tent, Combination..... 473
Pack Sack Straps, Improving ..... 484
Package for Shingles Reduces Loss in Shipping ..... 56
Packing, Metallic, for Use in Stuffing Boxes ..... 96
Packing Plant, Largest in Australia..... 406
Packing, Snug, Advantages of, Shown by "Tumble Drum" ..... 194
Pad Holder, Telephone, and Desk..... 323
Padlock, Keyless, Radium Dial Face on..... 207
Padlock, Safe Type, Has Numbered Combinations ..... 444
Pads, Air Filled Swimming, Give Free Arm Action ..... 203
Pageant, Colorful, to be Staged at Atlantic City Boardwalk ..... 491
Pageant Scene of "the Landing of John Smith" ..... 439
Pagoda, Japanese, Made of Real Pearls.... 401
Pails, Stencil Color, for Painters..... 153
Paint, Blistered, Removed by Compressed Air ..... 663
Paint—Lacquers, Use of ..... 646
Paint, Removing from the Hands..... 308
Paint Spraying Machine, Light and Compact 727
Painters, Stencil Color Pails for..... 153
Painting Hints for Walls..... 946
Pan, Aluminum Pie, Has Rim for Catching Juice ..... 114
Pan, Frying, Turns Eggs by Giving Sharp Jerk ..... 279
Pan, Glass Cake, with Hole in Center..... 443
Pan Set for Baking on Gas Flame Stove... 606
Panama Canal Widening at Gaillard Cut... 738
Pantograph, Mapping Vegetation with..... 745
Pantry Cabinet, Sanitary Ventilated..... 606
Paper and Carbon Sheets, Cabinet Holds.. 373
Paper Cone Removes Small Lamp Bulbs.. 489
Paper Finish, Improved Instrument for Testing ..... 760
Paper Holders, Attachment for..... 321
Paper Making Experiments in Western Australia ..... 66
Paper—Newsprint, Amount of, U. S. Uses Yearly ..... 661
Paper, One Man Electric Crane for Handling ..... 108
Paper, Pencil Holder Made from..... 465
Paper That Can be Washed Made by Japanese ..... 381
Paper, Using as Kindling Wood..... 153
Paper Weight, Neat, Contains Magnifying Glass ..... 107
Parachute Jump, Record, More than Four Miles ..... 184
Parade, Fire Horses Make Last Run at..... 35
Parade, "Keep the Forests Green"..... 574
Parade, Student, Wireless Band in..... 768
Paraffin, Developing Tray Made of..... 974
Paraffin Melted in Teapot When Canning.... 315
Parcel Truck, Dumping, in Chicago Post Office ..... 338
Parchment, New, Antique Color for..... 781
Park and Camp Sites Given State of Michigan ..... 705
Park Magazine Boxes on Trees for Use of Public ..... 766
Park, National Forest, Reserved for People 586
Park Picnic Tables, Sanitary Walled, in Calif. ..... 111
Park Rubbish Box, Novel..... 474
Parking, Auto, on Garage Roof..... 39
Parking Lamp, Automobile, Neat ..... 400
Partitions, Making for Catalog Files..... 318
Patches, Blowout, Rawhide Used in..... 117
Patches, Scriber for Marking..... 124
Patterns, Making from Dry Sand Cores.... 948
Paul, George F.:
  Bathhouse, Hot Spring, for Salt Lake City ..... 532
  Bridge Building, Alaskan, Tests Engineering Skill ..... 67
  Motion Picture Camera Records Vital Facts in Rail Demonstration..... 236
  Sewer, World's Largest, Kansas City Builds ..... 377
  Subway, Surface, and "L" Systems Combined ..... 750
Pavement, Durable Wood, Is Dustless and Silent ..... 354
Paving Material, Worn Out, Recrushed for Ballast ..... 176
Payments by Wireless Now Made While Aboard Ocean Liners..... 107
Payrolls, Clock with Decimal Face for Figuring ..... 904
Pea and Soy Beans Thresher Used with Grain Binder ..... 280
Peace Exhibition, Beautiful, Japanese Hold 401
Peaches Resemble Pumpkins on Ohio Fruit Farm ..... 382
Pearl Necklaces Offered for Best Title for Picture ..... 983
Pearls, Artificial, How to Make..... 806
Pearls, Real, Japanese Pagoda Made of..... 401
Pears, Ripeness of, Machine for Testing.... 82
Peat, Hard Water Softened by Use of..... 196
Peat, Water Jets and Pump Used in Treatment of ..... 48
Pedal Arrangement, Auto, for Driving with One Foot ..... 326
Pedal Control, Heel, Placed on Electric Autos ..... 419
Pedrose, Lawrence Wm.:
  Motorists' Caravansary Is New Industry.. 523
  Rice Farm Labor, Oriental, becoming Harder ..... 255
Peg, Banjo, Holds and Tunes Strings..... 722
Peg, Nonslipping Tuning, for Banjos..... 936
Pen, Antiseptic Iodine, Has Ready Supply.. 44
Pen Eraser, Fountain, like Tip on Pencil.. 180
Pen, Fountain, and Refillable Pencil in One 765
Pencil Case and Calculator Combined..... 613
Pencil Holder Made from Paper..... 465
Pencil Marker, Useful ..... 140
Pencil, Refillable, and Fountain Pen in One 765
Pencil Sharpener Produced with Tool Steel Blade ..... 84
Peninsula, South Africa, Encircled by Roadway ..... 775
Penstock Pipes Utilized for Storage Purposes ..... 599
Percolating Machine, Coffee, for Continuous Service ..... 214
Percolator, Electric Coffee, Is Self-Pouring 282
Persimmons Bars, Chocolate, a New Kind of Candy ..... 892
Petroleum as Fuel for Airplane Motor..... 769
Philippines, Independence for, by H. H. Windsor ..... 359
Phonograph and Wireless Telephone in One Cabinet ..... 210
Phonograph Cabinet Made from Hollowed Log ..... 500
Phonograph, Human Throat Inspiration of 557
Phonograph, Language Study on..... 147
Phonograph, Making Portable for Schools.. 312
Phonograph Needle Six Feet Long..... 694
Phonograph Records, Automatic Device Turns ..... 507
Phonograph Records, Device for Holding.. 393
Phonograph Records, Ear Tubes Used in Choosing ..... 727
Phonograph Records, Nonbreakable Metal... 168
Phonograph Reproducer, Violin as..... 637
Phonograph Sound Box Used as Wireless Amplifier ..... 688
Phonograph Used as Wireless Loud Speaker 450
Phonograph, Using for Winding Purposes.. 154
Phonograph, Wireless Sound Amplifier Made from ..... 145
Photograph Sent by Wireless from Rome, Italy to Bar Harbor, Me..... 188
Photographic Films Ruined by Carnotite Ore ..... 404
Photographic Records Made of Sound Vibrations ..... 407
Photographs and Motion Pictures Broadcasted by Wireless ..... 824
Photographs by Amateurs or Professionals, Prizes Offered for ..... 819
Photographs, Prizes Offered for, Submitted to Magazine Monthly..... 655
Photography:
  Camera, Aerial, Efficient High Speed.... 26
  Camera, Cork in, Prevents Double Exposures ..... 808
  Camera, Folding, Photographing Small Articles with ..... 485
  Camera Shutter, Mousetrap for Tripping 967
  Camera, Small Foreign Made, Possesses Ultra Speed ..... 868
  Cameras, Two New Airplane, Developed by Experts ..... 23

Photography: (Continued)
Child Portraiture, New Captivating Method for ..... 450
Dark Box for Photographers ..... 146
Dark Room Made from Wash Boiler and Coat ..... 976
Developing Outfit, Compact Pocket Size.. 32
Developing Tray Made of Paraffin..... 974
Enlarger, Homemade Vertical..... 479
Film, 100 Feet of, Finished in Holder at Same Time ..... 761
Films, Soaking in Water before Developing ..... 486
Focus, Sharp, Making Sure of..... 489
Hanger for Cut Films Made from Spring.. 152
Lightning Bugs "Flashes" on Photographic Plates ..... 540
Negatives, Enlarged, How to Make..... 818
Pictures at the Rate of 92,000 Per Second, by A. N. Mirzaoff ..... 541
Plates, Photographic, Made of Gelatin on Paper ..... 240
Positives Made Direct from Camera..... 310
Print Washer, Novel ..... 810
Reel for Developing Roll Films..... 326
Snapshot Exposures, Timing..... 156
Piano, Miniature Upright, with Pedal Keyboard ..... 40
Pianos, Upright, Have Tone Amplifiers..... 440
Picker, Cherry, Effective Homemade..... 474
Picnic Grounds, Sanitary, in Calif. Has Wall Around Tables ..... 111
Picnic Kit, Suitcase Made into ..... 325
Picnic Lunch Box and Table, Folding..... 476
Picture, Best Title for, Pearl Necklaces Offered for ..... 983
Picture Frame Clamp, Simple, How to Make 981
Picture Pages, Children's..... .....120, 284, 448, 612, 776, 942
Pictures and Mirrors, Device for Hanging 584
Pictures, Interesting Automobile, Prizes Offered for ..... 491
Pictures—Photographs by Amateurs or Professionals, Prizes Offered for..... 819
Pictures, 92,000 Taken Per Second, by A. N. Mirzaoff ..... 541
Pie Pan, Aluminum, Has Rim for Catching Juice ..... 114
Pier Decking Constructed with Safety Openings ..... 60
Piers, Concrete, Replaced by Unusual Methods ..... 757
Pigeons, Artistic Bungalow for.....407
Pile Driver, Huge, Moved on Two Greased Poles ..... 224
Pile Drivers, Chinese, Singing Leaders Speed ..... 430
Piles, Big Concrete, Divers Work in Cavities of ..... 554
Pinch Dogs Made from Nails..... 470
Pinholes, Transferring in Shafts..... 618
Pipe, Automobile Oil Feed, Cleaning..... 796
Pipe, Bituminous Clay, Using for Drainage and Sewerage ..... 408
Pipe Center Base, Boring Out, in Lead Chuck ..... 454
Pipe, Concrete, Standardization of Methods Improves ..... 93
Pipe Connection, Water Tight, for Concrete Tank ..... 627
Pipe Filler, Combination, and Tobacco Case 517
Pipe Joints, Screw, Making Tight..... 949
Pipe Laid under Street without Excavation 276
Pipe, Large, On Bicycle Advertises Shop.. 724
Pipe Stems, Loose, Tightening ..... 318
Pipe Vise, Improvised ..... 457
Pipe, Welded Steel Overflow, 2,000 Feet Long ..... 238
Pipe Wrench, Emergency, File and Monkey Wrench as ..... 133
Pipe Wrench, One Hand, Simple and Strong 122
Pipes, Concrete, New Hydrostatic Apparatus Tests ..... 6
Pipes, Huge Organ, Voiced Outside Factory 398
Pipes, Penstock, Utilized for Storage Purposes ..... 599
Pipes, Submarine Oil, from Wells to Ships at Sea ..... 34
Piping System, Bathing Beach Water Purified with ..... 211
Pistol, Automatic, Combined in Flashlight.. 244
Pistol, Small, Concealed in Palm of Hand.. 913
Piston, Adjustable, Controls Compression Space Volume ..... 882
Piston Heads, Locomotive, Renewing..... 616
Piston, Novel Engine, Keeps Oil from Combustion Space ..... 610
Piston Vise, Homemade ..... 302
Pistons, New Lightweight, with Curbed Expansion ..... 904
Pit, Repair, Movable Bench for..... 306
Pitchfork, Litter Rake Made from..... 317
Plane Adjustment Made Easy to Reach..... 136
Plane Bits, How to Grind..... 631
Plane Cutters, Inner Tubes for Protecting.. 300
Planer Clamp for Awkward Pieces..... 125
Planer Clamp, Novel..... 299
Planet "Venus," the Future of..... 844
Plants:
Cat Tail Growths, Hogs Thrive on..... 4
Dandelions, How to Kill..... 482
Paraguayan, Sweetening Qualities of.... 768
Sea Plants, Lime Secreting, Aid in Reef Building ..... 608
Plaster and Lime Stains, Removing from Floors ..... 476
Plates, Photographic, Made of Gelatin on Paper ..... 240
Plates, Steel, Traveling Multiple Drill for 46
Platform, Improvised, for Driving Posts.... 562
Platforms, Street Car Loading, in Los Angeles, Calif. ..... 602
Plating, Chrome, Possible by New Process.. 611
Plating—Copperplating Brass for Laying Out ..... 624
Plating—Replating Worn Spots ..... 620
Platinum Filings, Cleaning..... 452
Play Car, New, Has Clever Drive..... 353
Play Scene—Landing of Captain John Smith 439
Playground Given Children in National Forest ..... 171
Playground Merry-Go-Round, Safe, Makes Exercise a Joy ..... 774
Playground, National Forest, Reserved for People ..... 586
Playhouse Has Convertible Furnishings.... 284
Playhouse, Small, Designed by Girl..... 121
Playlet, Stock Exchange, Instructs Safe Investments ..... 655
Plow, Self-Propelling, with Rotating Shares 271
Plowshare, Runner for ..... 780
Plug Attachment Accommodates Two Electrical Utensils ..... 771
Plugs, Cylinder Head, Removing..... 464
Plugs, Monkey Wrench Improved for..... 792
Plugs, Rotating Attachment, for Electric Fixtures ..... 878
Plumb, Square, and Rule Combination for Home Mechanics ..... 154
Plumbing—Pipe Wrench, One Man, Is Simple and Strong..... 122
Plummer's Tool Has Automatic Jaws..... 116
Poem, Bird or Flower, Prize Offered for.. 327
Poem—Confession, by James A. Sanaker... 492
Poem—Fishing the Ether, by George F. Staat ..... 492
Poem—"Sale of Repairs" ..... 328
Poison—Carbon Monoxide in Blood, Simple Test for Determining Quantity of..... 242
Poison Fumes in One Apartment Kills in Another ..... 4
Poison Indicator, Luminous, for Bottles.... 608
Pole, Wireless Aerial, Erected by One Man 366
Poles, Completely Assembled, Raised from Ground ..... 746
Police Department:
"Bandit Squad" Police Employ Motorcycles and Sidecars in Philadelphia..... 767
Gun, Antibandit, in Demonstration, by Eric A. Dime..... 41
Horn, Hand Operated, for Traffic Police.. 441
Police, Mounted, for Highways, by H. H. Windsor ..... 703
Police Stations, Wireless Apparatus Proposed for ..... 177
Police, Wooden, Guard University Campus 356
Rifle Target, Animated, for New York Police ..... 827
Rock Pile, Huge for Speed Law Violators. 274
Science becomes Police First Aid, by John Anson Ford ..... 869
Telephone Exchange, New York Police, Is Largest Private Exchange in World.... 275
Polish, Metal, Walrus Hides Valuable as.... 830
Polishing Tool for Bored Holes..... 304
Polo Goal Post Made Harmless at Hongkong Club ..... 32

Pool, Swimming, Skimming Flotsam from Surface of ..... 461
Poplar Trees Near Sidewalk "Outlawed" in Detroit ..... 892
Popper, New Rotary Corn, for Home Use.... 186
Population, World's, Increase of, by H. H. Windsor ..... 701
Porch Railing, Discarded, Fence Made from. 620
Porch Swing Stand Used for Hanging Clothes 804
Porcupine and Coon Meet on Same Tree Branch ..... 612
Port, Largest Flour, Philadelphia may become ..... 499
Port, New, to Make Atlantic Passages Shorter 568
Positives Made Direct from Camera..... 310
Post, Lamp, on Porch to Guide Visitors..... 602
Post Office Department:
  Mail Airplanes, Efficient Service of..... 722
  Mail, Handling of, "Pick Up" Table Speeds 726
  Mail Pouch, Small, for Mailing Souvenir Cards ..... 775
  Mail Tubes, Pneumatic, in New York to be Repaired ..... 878
  Stamp Invoicing Appliance for Rapid Accounting ..... 48
  Truck for Dumping Parcels..... 338
Post, Polo Goal, Made Harmless at Hongkong Club ..... 32
Postage Rate, Newspaper, Reduce The, by H. H. Windsor ..... 209
Postpile, Huge, Rock Formation Resembles, by John L. Von Blon..... 54
Posts, Clothesline, Sweet Pea Trellises Serve as ..... 743
Posts, Concrete Gate, Forms for..... 789
Posts, Fence Replaced by, along Highway in Calif. ..... 767
Posts, Improvised Platform for Driving..... 562
Posts, Steel, Making Concrete Bases for..... 632
Potato Digging Machine Picks, Cleans, and Sacks in One Operation..... 237
Potato Plant Sprayer Mounted on Motorcycle ..... 226
Poultry Drinking Fountain, Automatic..... 119
Poultry Feed Stand Conveniently Arranged. 899
Poultry House Cracks, Newspapers for Filling ..... 310
Poultry House Ventilator Base Adjustable to Pitch of Roof..... 401
Poultry Roost, Miteless..... 648
Poultry, Self-Feeder for..... 647
Pounding Block, Strap Handle for..... 633
Powder, Tons of, Towed in Six Barges by Single Tug ..... 196
Power Plant and Splash Dam in Miniature.. 918
Power Plant Design, New Water, Increases Efficiency ..... 526
Power Plant, Large Gas Fired, Proves Efficient ..... 578
Power Plant, Picturesque, in France, by Allen P. Child..... 923
Power Project, Alpina Lakes to Form Link in ..... 575
Power Stations, Electrical Output of, Pooled in England ..... 543
Prayer Wheels, Electric, Operated in India.. 86
Preambulator, Gasoline Motor Driven..... 215
Preservative, Wood, Testing Penetration of. 798
Press, Tire, and Hoist Saves Time and Labor 37
Press, Trouser, Homemade..... 816
Pressure, Water, Per Square Inch..... 472
Priestley, Bernard G.:
  Incandescent Lamp Is Largest in World... 841
  Wind Tunnel, New Type, for Airplane Testing ..... 77
  Wireless Receiving Aerial, New Transatlantic, Strung on Telegraph Poles..... 17
Prince of Wales Has Novel Experiences in Japan ..... 187
Print Washer, Novel..... 810
Prize Offers:
  Airplane Contest, Commercial..... 163
  Automobile Pictures, Interesting..... 491
  Book of Self Revelation..... 819
  Building Designs ..... 327
  Business Code, Best 50 Word..... 655
  Chocolate Confections, Best Recipes for... 983
  Clock Case Design..... 819
  Essays on Americanism..... 327
  Essays on Historical Novel..... 491
  Essays, Pasteur ..... 327
  Essays, "The Story of Mankind"..... 163
  Farmers, Oldest U. S..... 655
  Fishing Contest ..... 163
Prize Offers: (Continued)
  Horseshoe Pitching ..... 491
  Hotel, Business Promoting Ideas for..... 655
  Liaison System, Best, between Artillery and Infantry ..... 655
  Literature and Kindred Arts, Excellence in 820
  Mathematical Research Work..... 163
  Microbiology, Eminent Work in..... 163
  Musical Compositions ..... 655
  Name, Best Professional, for Screen Artist 819
  Needlework, Many Kinds of..... 983
  Novel by an American Author..... 327
  Photographs, Best, by Amateurs or Professionals ..... 819
  Photographs, Best for Monthly Magazine.. 655
  Picture, Best Title for..... 983
  Poem, Flower or Bird..... 327
  Railroads, Back Yard..... 327
  "Shut-Ins," New Occupations for..... 163
  "Silvore," Best Name to Replace..... 655
  Surgery, Advancement of..... 163
  Symphonic Composition, Best..... 655
  Truck, Electric, Best Slogans for..... 983
  Work, Eminent, of Women..... 491
Procession, Gorgeous Hindu Tamil, in Ceylon 873
Projecting Apparatus for the Study of Art.. 393
Projector Enlarges Gear Teeth for Inspection ..... 237
Projector, Motion Picture, for School and Homes ..... 725
Projector, New, for Showing Home Motion Pictures ..... 62
Prop, Collapsible Clothes, How to Make..... 978
Propeller, Reversible, Made for Dirigible Balloon ..... 251
Propellers, Cast Iron, Made Smooth by Enamel Coating ..... 890
Propellers, Pitch of, Instrument Indicates... 732
Protective Material, New, for Radiological Work ..... 498
Protector, Gasoline Tank, Odd Appearing... 514
Protector, Shirt and Waist, for Automobile Trips ..... 494
Proving Ground Fire Car Has Complete Outfit ..... 760
Prune Sirup Developed to Equal Maple Sirup 238
Pruning Chisel, Tree, Long Handled..... 94
Pulley, Jaw Clutch, How to Make..... 949
Pulley, Simplified Split, Has no Bolts or Nuts 116
Pulleys and Flywheels, Old, Refacing..... 451
Pulleys, Compressed Canvas for..... 916
Pulleys, Cutting Oil Grooves in..... 455
Pulleys, Driving, for Magneto Testing..... 628
Pulleys, How to Disk-Grind..... 472
Pulleys, Loose, How to Oil..... 134
Pulp, Stored Wood, Decay in, Experimentally Prevented ..... 22
Pulpwood Decay, Reducing by Proper Storage ..... 952
Pump Arrangement, Novel, for Deep Wells.. 485
Pump, Auto, Inflates Tires Using Engine Suction ..... 365
Pump, Computing Gasoline, for Service Stations ..... 897
Pump, High Vacuum, for Laboratory Use... 778
Pump Jack, Three Speed Automatic..... 774
Pump Lubricators, Preventing Leakage through ..... 306
Pump, Novel Wheel, for Draining Marshland 597
Pump, Oil, Similar to Gasoline Curb Pump.. 189
Pump, Rotary, for Use on Tractor..... 729
Pump, Siphon, for Heavy Liquids..... 136
Pump, Spray, Garden Hose as Substitute for 318
Pump, Tire, Used for Blowing Lamp Burners 624
Pump, Village Water Plant, Auto Engine Runs ..... 665
Pumping Outfits, Automobile Motors Used in 734
Pumping Plant, Automatic, for Household Use ..... 540
Pumping Station on Incline Follows Water Level ..... 936
Pumping Unit, Detachable, on Fire Engine. 216
Pumps and Water Jets Used in Treatment of Peat ..... 48
Pumps, High Pressure, for New York Fireboats ..... 903
Pumps, Small High Pressure, How to Make. 462
Punch, Bench, Homemade..... 303
Punch, Center Locating, and Scriber Combined ..... 260
Purifier, Feed Water, Reduces Boiler Scale.. 772
"Push Ball" Game Played with Automobiles. 81
Pushboat, How to Build..... 635
Pusher, Railway Car, Uses Adjustable Fulcrum Feature ..... 890

Puzzle, Ring-and-Peg ..... 312

Quartz Mill, Prospector's, Easily Portable... 937

Race, International Balloon, Ends in Doubt. 516
Race, Outer Ball, Removing from Auto Wheel 289
Race, Pacific Fleet Boat, Closely Run..... 709
Race Track, Auto, Built Under Difficulties.. 730
Race Track, World's Fastest, Stages First Event ..... 910
Races, Automobile Ball, How to Break Out. 960
Rack, Assorting, for Rough Dry Work in Laundry ..... 429
Rack, Convenient Tool, How to Make..... 977
Rack, Magazine, Homemade..... 641
Rack, Magazine, on Park Trees for Use of Public ..... 766
Rack, Tong, for Blacksmiths..... 955
Radiator, Auto, Water Level Indicator for.. 277
Radiator, Auxiliary, for Pipeless Furnace... 478
Radiator Condenser, Automobile, Made in Form of Still..... 254
Radiator Covers, Steel, to Match Furniture. 447
Radiator Device, Attractive Auto, Warns of Overheating ..... 928
Radiator Guard for Tractor..... 618
Radiator Steam, Device Controls as Desired. 450
Radiator Valve Controlled by Touch of Foot 944
Radiator Valve, Leak-Proof, without Packing ..... 72
Radiator Valve, Simple, Requires No Packing 234
Radiator Whistle, Auto, Warns of Overheating ..... 673
Radioactive Minerals Found in Italy..... 941
Radiological Work, New Protective Material for ..... 498
Radium Bearing Minerals on Island of Madagascar ..... 66
Radium Dial Face, Keyless Padlock Has.... 207
Rag Strips, Joining for Weaving..... 801
Rag Trade, Tariff Revision Expected to Reverse ..... 445
Railroad Appliance—Coal Shovel, Locomotive, Automatic Counters on..... 66
Railroad, Back Yard, Prizes Offered Boys and Girls for..... 327
Railroad Box Car Converted into Handy Classroom ..... 909
Railroad Bridge, Alaskan, Tests Engineering Skill, by George F. Paul..... 67
Railroad Bridge, Bascule, Controlled by Moving Counterweight ..... 880
Railroad Car, Gasoline, for Passenger Service 919
Railroad Car, Gasoline, for Short Trips..... 98
Railroad Car Pusher Uses Adjustable Fulcrum Feature ..... 890
Railroad Car Wheel Tires Electrically Heated and Fitted by Shrinkage..... 933
Railroad Cars, Australian, Present Strange Sight ..... 425
Railroad Cars, Gasoline, Cut Operating Costs 73
Railroad Cars, Impact Device Records Rough Handling of ..... 80
Railroad Coal Train Wrecked When Deserted by Crew ..... 404
Railroad Crossing Accidents, by H. H. Windsor ..... 866
Railroad Crossing Sign at Norfolk, Nebraska 274
Railroad Crossing Sign Warns Motorists.... 766
Railroad Crossing Signal Has Three Lights. 889
Railroad—Drawing Rooms En Suite on Trains to Coast..... 688
Railroad Extension, Recent, in East Central Africa ..... 540
Railroad, First Canadian, to Install Wireless 212
Railroad—Floodlights on Trains, by H. A. Lane ..... 514
Railroad—Freight Cars, Truckmen's Safety Toe Board for ..... 50
Railroad Journal Jack, New Type, Is Simple and Compact ..... 432
Railroad—Lantern, Trainmen's Signal, Carries Oil in Handle..... 852
Railroad—Locomotive Exhaust Steam Saves Coal ..... 189
Railroad—Locomotive, How Far Can It Jump? by Francis W. Wilson..... 674
Railroad—Locomotive, Most Efficient and Powerful Ever Built..... 187
Railroad—Locomotive Piston Heads, Renewing ..... 616
Railroad—Locomotive Sand Boxes, Improvement in ..... 117
Railroad—Locomotive Sheds, Italian, with Asbestos Roofing ..... 429
Railroad—Locomotive, Small Tractor Changed into ..... 256
Railroad Locomotives, Export, Floating Crane Unloads ..... 867
Railroad—Locomotives, Powerful, Used in Switzerland ..... 858
Railroad—Locomotive, Swedish, Ready for Delivery to Russia..... 49
Railroad—Locomotives, Train of, Half Mile Long ..... 165
Railroad, Miniature, Demonstrated at English Exhibition ..... 35
Railroad, Narrow Gauge, Inclined Turntable for ..... 577
Railroad Rails, Motion Picture Camera Records Vital Facts in, by Geo. F. Paul..... 236
Railroad Semaphores, Interurban, Operated by Public ..... 85
Railroad Station, Union and Central, Modernizing in Chicago, by Cleveland Gaines. 19
Railroad, Strange, Carries Boats from Lake to Sea ..... 355
Railroad Terminal, Chicago's, Amount of Electrical Energy for..... 180
Railroad Train Illumination, Turbine and Dynamo Units for..... 875
Railroad—Train, Night, Has "Stag" Sleeper for Men ..... 234
Railroad Train, Steel, Wireless Loop Aerial Used in ..... 868
Railroad Trains, Gasoline, Cut Operating Costs ..... 748
Railroad Trains House Legion Men at New Orleans ..... 876
Railroad—Turntable, Locomotive, 100 Feet Long ..... 280
Railroad, Weed Exterminator Built by..... 262
Railroad Weed Uprooting Machine..... 441
Railroad Wreck, Coaches Reduced to Kindling in ..... 495
Railroad Wreck, India, the Result of Plot... 52
Rails, Railroad, Motion Picture Camera Records Vital Facts in, by Geo. F. Paul..... 236
Rain Barrel Regulator, Simple..... 638
Rain Cape for Hats can be Folded..... 278
Rake, Hay, on Motor Truck Functions Efficiently ..... 35
Rake, Improved, for Leaves..... 647
Rake, Litter, Made from Pitchfork..... 317
Rake Teeth, Clothespins Used as..... 145
Ram, Compressed Air, for Baling Empty Cement Bags ..... 827
Range, Gas, Has Efficient Method of Combustion ..... 556
Rat Alarm, Improvised..... 309
Rat Extermination Problem Turned into Sport ..... 769
Rattlesnake Catching Pursued for Profit and Pastime ..... 655
Rattlesnake Etiquette for Tourist and Camper, by John Edwin Hogg..... 197
Rattlesnake, Live, in Window Display..... 684
Rawhide Used in Fan Belts and Blowout Patches ..... 117
Razor, Flashlight, Permits Shaving in the Dark ..... 664
Reamer and Gauge Holder Combined..... 133
Reamer, Fluted Expansion, Has Alining Pilot 445
Reamer Holder to Produce Accurate Reaming ..... 584
Reamer, Motor Driven, Wholly Self-Contained ..... 72
Reamer, Piloted Taper ..... 288
Receiver, Portable Wireless, How to Make.. 649
Receiver, Short Wave Wireless, Honeycomb Coils for ..... 313
Receiver, Wireless, How to Make..... 814
Recipes, Chocolate Confection, Prizes Offered for ..... 983
Record, Phonograph, Automatic Device Turns ..... 507
Recording Device Shows Position of Airplane Controls ..... 219
Records, Phonograph, Device for Holding... 393
Records, Phonograph, Ear Tubes Used in Choosing ..... 727
Records, Phonograph, Nonbreakable Metal, Now Made ..... 168
Recreation Spot at Rear of Bookstore in Pasadena, Calif. ..... 110
Rectifiers, Electrolytic, How to Make..... 629
Rectifiers, Mercury Arc, of Large Capacity. 10

Reef Building, Lime Secreting Sea Plants Aid in ..... 608
Reel, Assorting, for Rough Dry Work in Laundry ..... 429
Reel, Cord, Two Handled ..... 802
Reel for Developing Roll Films ..... 326
Refinery, Portable, for Use in New Oil Fields, by Curtis Vinson ..... 418
Reflector, Largest Telescope, Cast in America ..... 10
Reflector, Light, Novel Inverted ..... 639
Reflectors, Crystal Glass, for Spotlights ..... 112
Reflectors, Tarnished Headlight, Restoring .. 816
Refreshment Stand, Mammoth Barrel Is .... 722
Refrigerator Deodorizer Absorbs all Odors .. 115
Refrigerator, Device Saves Ice in ..... 967
Refrigerator, Electric Light for ..... 489
Refrigerator, Scale and Meter Measure Ice in 392
Refrigerator, Small Portable, for Nurseries, Hospitals, and Small Families ..... 114
Registers, Furnace, Used as Ventilators ..... 152
Reindeers Branded by Notches in the Ears .. 444
Release, Air, for Inner Tubes ..... 315
Relic—Coin, Large Swedish Copper, Is Ancient Relic ..... 270
Relic—Water Drawing Gear of Ancient Days 376
Relics, Ancient, Unearthed in Mound Near St. Louis, Mo. ..... 269
Relief and Drain Valves for Steam Cylinders 512
Religion, Star Island Dedicated Exclusively to ..... 539
Relining Fixture for Brake Bands ..... 948
Remover, Handy Paint, for Garage ..... 142
Repair Pit, Movable Bench for ..... 306
Repair Shop Signs, Amusing ..... 735
Reptile—Lizard, Strange, Studied Near a Dead Sea ..... 922
Reptile—Rattlesnake, Live, in Window Display ..... 684
Reservoir, Cedar Stump, for Water System .. 402
Reservoir, Dew, for Watering Cattle ..... 90
Reservoir, Emptying, Acts as Giant Bathtub 240
Reservoir, Separate Water, for Household Supply ..... 250
Rest, Adjustable, for Workbench ..... 634
Rest, Soldering Iron ..... 452
Retainer, One Piece Spring, for Poppet Valve Stems ..... 119
Revolver, Small, Easily Concealed in Palm of Hand ..... 913
Revolvers Should be Abolished, by H. H. Windsor ..... 704
Rheostat and Jack Switch Combined for Wireless ..... 706
Rheostat Mounting, Novel Wireless ..... 153
Rheostat, Wireless Filament, Made of Carbon Disks ..... 38
Rheostat, Wireless, for Vacuum Tubes Has Good Qualities ..... 170
Ribbon, Colored, Machine for Drying ..... 107
Rice Farm Labor, Oriental, becoming Harder, by Lawrence Wm. Pedrose ..... 255
Rifle Target, Animated, New York Police Department Has ..... 827
Rifle, .22 Caliber, Rechambering ..... 464
Rifles, High Powered Hunting, Offered in Novel Fishing Contest ..... 163
Rifles, New Superaccurate, of U. S. Standard Caliber ..... 846
Rim, Auto, Flower Bed Made from ..... 316, 475
Rim, Auto Mud, Prevents Skidding ..... 2
Rim Spreader, Split Auto, How to Make ..... 812
Rim Wrench, Auto, Has Four Sizes of Sockets ..... 58
Rims, Split, Homemade Remover for ..... 324
Rings, Metal, for Dinner Plates Keeps Food Hot ..... 880
Rings, Story, for Children ..... 285
River Channel, Remodeling, by Ivan E. Houk ..... 230
River Front, New Orleans Raises, by Thomas Ewing Dabney ..... 369
River, Humber, Utilizing for Electric Power 758
River Impounding Project of Vast Proportions ..... 58
River Made to Pursue Prescribed Course, by J. B. Holdcroft ..... 754
River, Rio Grande, Texas Plans Flood Control on ..... 707
Riveting, Double, Stronger than Single ..... 291
Rivets, Device Passes Automatically ..... 512
Rivets, Fitting Sheet Metal Over ..... 789
Rivets, Hot, Holder for Handling ..... 949
Road Building Dump Wagons, Oversize ..... 328
Road Building Gravel, Hardness of, New Device Tests ..... 93
Road Building Work, Mountain, Shown in Government Motion Picture Film ..... 208
Road, Concave Concrete, of English Design. 64
Road Construction, Impact Machine Tests .. 216
Road Construction, Motor Truck Turntable Speeds ..... 547
Road Crusher, Concrete ..... 723
Road Maintenance System, Wisconsin's Efficient ..... 366
Road Maintenance Truck Has Complete Equipment ..... 102
Road Maintenance Truck Has Scraper Attachment ..... 49
Road Map Holder, Motorcycle, Fastens to Handlebars ..... 358
Road Models for Engineering Colleges, by S. R. Winters ..... 907
Road, Nebraska, Penetrates Famous Wilderness ..... 577
Road, New, on Mountain Pass ..... 494
Road Paving, Concrete, Moisture Tests Made on ..... 601
Road Paving Material, Worn Out, Recrushed for Ballast ..... 176
Road Repair Patrol System for Province of Quebec ..... 76
Road Repairing, Wheelbarrow Heater for ... 535
Road Roller, Small Tractor Converted into .. 932
Road—Route, Auto, from Juarez to Mexico City being Promoted ..... 684
Road Smoothness, Strange Appearing Machine Tests ..... 206
Road, Spiral, on Tenderfoot Mountain, by J. H. Freeman ..... 395
Road, Storm King Mountain, Ready for Auto Traffic ..... 715
Road to Encircle Peninsula of South Africa. 775
Roads, Concrete, Keeping from Cracking .... 503
Roads, Motor, Honduras Now Building ..... 663
Robe, Auto, Rolls into Cylindrical Footrest .. 677
Rock Crusher, Largest, Holds Full Wagonload ..... 563
Rock Drill Bit, Detachable, Indicates Economy ..... 600
Rock Excavation, Deepest, for New York Store, by T. Benjamin Faucett ..... 384
Rock Formation, Fantastic, in Mammoth Mexican Cavern ..... 854
Rock Formation, Historical, Made Navigation Aid ..... 244
Rock Formation Resembles Huge Postpile, by John L. Von Blon ..... 54
Rock Pile for Speed Law Violators ..... 274
Rock Salt Mine, Visiting, by David H. Livingston ..... 411
Rocks, Large, Dragging with Tractor ..... 797
Rod Holder, Welding, Double ..... 136
Rods, Connecting, for Model Machinery ..... 477
Roller Jewels, Watch, Tool for Setting ..... 213
Roller, Road, Small Tractor Converted into. 932
Roller Skates, Cross Country Trip on ..... 661
Roller Skating Carnival Held on Busy Street 228
Rolls, Paper, Attachment for ..... 321
Roof, Garage, Automobile Parking Space on 39
Roofing Materials Tested for Heat Radiation 717
Roofing, Rolls of, Preventing from Crushing 620
Roofing, Strong Corrugated, of Asbestos and Cement ..... 71
Roost, Miteless Poultry ..... 648
Rooster Rides on Handlebars of Bicycle .... 613
Roots, Imperiled Tree, Method of Protecting 768
Rosebush Climbs Foliage of Tall Tree at Santa Rosa, Calif. ..... 766
Roughening Machine for Smooth Concrete Surface ..... 946
Round Stock, Centering ..... 792
Round Work, Holding in a Vise ..... 292
Rowboat, Collapsible, Made to Carry Three .. 582
Rowboat, Open, Cruise of Great Lakes in ... 550
Rowboat, Sectional Flat Bottom, How to Make ..... 307
Rubber Bathing Slippers Protects Feet ..... 442
Rubber File Grip Protects Hands ..... 365
Rubber Heels, Detachable, for Slippers ..... 606
Rubber Latex Transported in Tank Steamers 773
Rubber Mallet for Auto Saves Tire and Rim 717
Rubber Matting Prevents Slipping on Polished Floors ..... 317
Rubber Mittens for Handling Brick ..... 640
Rubber Sleeving, Putting on Electrical Wire 623
Rubber Toothbrush ..... 115
Rubber Wheelbarrow Tires, How to Make .. 324
Rubbish Box, Novel, for Park ..... 474

Rudder, Double, New Form of, being Tested in Germany ..... 593
Rudder, Propelling, for Small Boats..... 520
Rugs, How to Hang on the Clothesline..... 322
Ruins, Ancient, Work of Exploring, by F. N. Hollingsworth ..... 595
Rule Device, Slide, Solves Trigonometric Formulas ..... 706
Rule, Draftsmen's, Contains Three Instruments in One ..... 272
Rule, Special Slide, Machine Time Calculated on ..... 269
Rule, Square, and Plumb Combination for Home Mechanics ..... 154
Rules, Slide, Magnifying Runner for..... 301
Rum Runners, Armored Automobile for..... 446
Runner for Plowshare ..... 780
Running Boards, Sagging, Strengthening... 653
Rusk, Rogers D.:
Chemical Elements, Artificial Transmutation of ..... 917
Russia the Helpless, by H. H. Windsor..... 360
Rust Scaling Tool, Electric, for Metal Surfaces ..... 6

Sacks, Cement, Amount of Cloth Used for... 940
Sacks, Empty Cement, Compressed Air Ram for Baling ..... 827
Saddle Strap, Leather, Converts Oxford into Sport Shoe ..... 935
Safe, Loud Sounding Alarm Safeguards..... 738
Safety Campaign, Extensive, to Reduce Injuries ..... 353
Safety First:
Acetylene, Pressure Required for..... 125
Automobile Fender, Automatic Life Saving 576
Automobile Mud Rim Prevents Skidding.. 2
Coal Substitutes, Hard, Caution Users of 696
Fence, Placier Point, Protects Visitors.... 191
Fire Prevention, Teaching, in Schools, by H. H. Windsor ..... 29
Horseshoes, Copper, Help Prevent Forest Fires ..... 430
Hose Streams, Danger in Directing on Charged Wires ..... 138
Interlocking Device for Elevator Doors... 592
Safeguard, Automatic, Operates with Swing Saw ..... 85
Tanks, Oxygen and Acetylene, Handling of 797
Wireless Fire Risk Avoidable, by H. H. Windsor ..... 31
Safety Signs, Taxicab, Carried by Company. 174
Safety Stop Automatically Acts as Belt Shifter ..... 239
Safety Tube, Gasoline Tank, Prevents Explosions ..... 611
Safety Valve for Gasoline Containers..... 875
Safety Valves on Faucets of Gasoline Tank Trucks ..... 928
Sailing Bark "Kobenhavn" to Complete with Ocean Steamships ..... 251
Sales Book, Foreign Trade Committees Publish ..... 272
Salt Mine, Rock, Visiting, by David H. Livingston ..... 411
Salt Shaker, Glass, Has Blades Inside for Cutting Lumps ..... 442
Sand Boxes, Locomotive, Improvement in... 117
Sand Containing Organic Matter Investigated for Making Concrete..... 244
Sand Drying Stove, Strong..... 608
Sand, Quality of, for Making Concrete..... 304
Sand Sifter, Electric, How to Make..... 292
Sandals, Rubber, Made from Auto Tires.... 227
Sander, Belt, Novel Motor Driven..... 385
Sandstone, Decaying, Two Methods of Preserving ..... 423
Sandwich Vending Machine Keeps Them Fresh ..... 70
Saw Bench, Tilting Arbor, Direct Motor Driven ..... 92
Sanitarium Patients, Tractor Hauls Warm Meals for ..... 84
Savings Book, New, Dime Bank in Rear Cover of ..... 882
Saw, Crosscut, How to File..... 133
Saw Cut, Starting Smoothly..... 801
Saw, Drag, Made Handy for Farm Use..... 621
Saw, Flooring, for Wiremen..... 632
Saw, High Speed Bench, Cuts Hard or Soft Metal ..... 700
Saw, Ice Cutting, Old Auto Engine Drives... 351
Saw, Motor Driven Jig, How to Make..... 950
Saw Oiler, Handy..... 619
Saw, Power Operated, for Cutting Ice..... 862
Saw, Stone Cutting, of Unusual Proportions. 16
Saw, Swing, Automatic Safeguard Operates with ..... 85
Saw, Wood, Fits Front of Tractor..... 178
Saxophone Holder, Adjustable, Is Self Supporting ..... 122
Scaffold, Adjustable Portable..... 652
Scaffold Dogs, Handy Type..... 627
Scaffold, Light Portable, Easily Moved..... 937
Scale, Boiler, Carbon Dioxide Softens..... 722
Scale, Boiler, Feed Water Purifier Precipitates ..... 772
Scale, Caliper Attachment for..... 787
Scale, Cleaning from Gray Iron Castings.... 455
Scale, Device Converts, into Automatic Machine ..... 610
Scale for Weighing Cargo through Ship's Draft ..... 60
Scale, Golf Ball, Gives Weight and Size..... 941
Scale, Visible Dial, Quickly Shows Exact Weight ..... 242
Scaler, Fish, Currycomb as..... 160
Scaling Tool, Electric, for Metal Surfaces... 6
Scarecrows, Substitute for, Devised by Sumatrans ..... 756
School Building, Largest, on Single Floor Plan ..... 243
School Children, Society Aids, in Study of Birds ..... 357
School—College Near Arctic Circle Opened by Alaska..... 673
School Desk, Movable, Requires Little Floor Space ..... 214
School, Largest Trade, Veteran's Bureau becomes ..... 338
School, One Room, for Kindergarten Pupils. 110
School Steps Has Low Risers for Small Children ..... 612
School, Technical, in India for Apprentices. 92
School "Traffic Maps" Guide Pupils through Building ..... 715
School Wardrobe Changes into Blackboard. 601
Schools, Teaching Fire Prevention in, by H. H. Windsor..... 29
Science Building to be Erected at Washington, D. C..... 392
Scientific Literature, Agency to Send, to Russian Scientists ..... 435
Scientific Research, Latest Developments in. 656
Scissor and Knife Sharpener, Simple..... 443
Scissor Blades, Triplicate, Have Buttonhole Shears ..... 106
Scissor Serrating Grinder, Speedy and Accurate ..... 404
Scissors, Folding, in Pencil Size Case..... 260
Scissors, How to Sharpen..... 127
Scissors, Magnetic, Picks Up and Threads Needles ..... 934
Scooter, Spring Seat, Has Roller Skate Wheels ..... 448
Scooter, Toy Water, How to Make..... 651
Scout, Boy, Hikes from Atlantic to Pacific.. 121
Scout Executive, Boy, Presented with Gold Eagle Badge ..... 942
Scouts, Boy and Girl, Native African..... 449
Scraper Attachment, Road Maintenance Truck Has ..... 49
Scraper, Steel, and Brush for Cleaning Pots and Pans ..... 278
Scratcher, Match, can be Attached to Inside of Coat ..... 114
Screen, Soot, for Open Windows..... 638
Screw Slotting Fixture, Rapid..... 301
Screwdriver, Extra Leverage for..... 147
Screwdriver for Rapid Work..... 626
Screws, Broken, Removing..... 953
Screws, Wooden, Provided for Difficult Places ..... 875
Scriber and Center Locating Punch Combined ..... 260
Scriber for Marking Patches..... 124
Sea Gulls Drop Clams on Roofs to Break the Shells ..... 691
"Sea Horse" Is Latest Bathing Beach Fad... 409
Sea Lions Shot from Boat Carrying Machine Gun ..... 906
Sea Plants, Lime Secreting, Aid in Reef Building ..... 608
Sealing Wax for Broken Typewriter Keys.. 652
Seamen, Lost, Memorial Tower in Honor of. 345
Seaplane Anchor Hoisting Winch, Navy Tests ..... 896
Seaplane, Giant, Carries 27 Persons..... 48

Seaplane, Loening, Makes Fast Trip from Florida ..... 215
Seaplane, New, Named for Wilbur Wright.. 845
Seaplane, Small, Turned Out in Germany... 525
Seaplane, U. S. Navy Is Developing for Land 535
Seaplanes, Kite on, to Carry Wireless Antenna ..... 96
Seaplanes Now Essential in Naval Maneuvers ..... 705
Seaplanes, Passenger Service, Make Record Flight from New Orleans to Chicago. 71
Searchlights, Brazilian Exposition Illuminated with ..... 496
Searchlights, Swarm of Bees Routed with... 118
Seasickness, Scientific Seesaw for Study of. 519
Seat, Auxiliary Auto..... 808
Seat, Bathroom, Folds into Wall..... 775
Seat, Divided Organist, Makes Playing Easier ..... 66
Seat, Extra Auto, Cylindrical Lunch Box Used as ..... 608
Second, Millionth of, Counts in Geodetic Survey Work ..... 984
Seed Catcher for Japan Clover..... 290
Seed Holders, Birdcage, for Nine Day Supply ..... 444
Seed, Kentucky Blue Grass, Is Valuable By-Product ..... 338
Seed, Machine for Saving from Barn Chaff. 298
Seeds, Amount of, in India Produced for Various Oils ..... 249
Seeds, Tree, Live through Forest Fires, by W. I. Hutchinson ..... 901
Seesaw, Adjustable, How to Make..... 317
Seesaw Built for One..... 639
Seesaw, Scientific, for Study of Seasickness 519
Selenium Cell, How to Make..... 793
Semaphores, Interurban, Operated by Public 85
Settling Chamber for Water System..... 618
Sewer Pipe, Bituminous Clay Used for..... 408
Sewer, World's Largest, Kansas City Builds, by George F. Paul..... 377
Sewing Kit Made from Cigar Box..... 809
Sewing Machine Belts, Keeping from Slipping ..... 967
Shackle Bolt Annealing Machine..... 468
Shade, Mounting of, Allows Top and Bottom Ventilation ..... 644
Shade, Preventing from Tearing from Roller 637
Shade, Window, Resembles Curtain on Inside and Shade Outside..... 115
Shades, Roller, Waterproof Cloth Produced for ..... 283
Shaft Couplings, Flexible, of Simple Construction ..... 736
Shaft Outfit, Flexible, for Jewelers..... 898
Shaft Pinholes, Transferring..... 618
Shaker, Glass Salt, Has Blades Inside for Cutting Lumps ..... 442
Shaker Top for Bottles..... 638
Shank, Emergency, for Farm Implements.. 626
Shaper and Drill Press, Indicator for..... 797
Shaper, Making to Cut on the Draw..... 961
Shark Fishing, Indicating Float for..... 24
Sharpener, Knife and Scissor, Simple..... 443
Sharpener, Pencil, Produced with Tool Steel Blade ..... 84
Shaving Accessory Holds Ready Supply of Lather ..... 770
Shear, Powerful, Made from Bar Stock.... 470
Shear Serrating Grinder, Speedy and Accurate ..... 404
Sheds, Italian Locomotive, with Asbestos Roofing ..... 429
Sheet Metal, Fitting Over Rivets..... 789
Sheet Metal, Knife for Cutting..... 617
Sheet Metal, New Machines, for Cutting.... 911
Sheet Metal, Perforated Business Signs Made of ..... 125
Sheets, Thin Metal, Machine Tests Workability of ..... 61
Shell—Bomb, Monster Demolition, Weighs 4,000 Pounds ..... 919
Shells, Condemned, as Buffers at Naval Station ..... 428
Shelter for Small Engine..... 461
Shield, Feather Corsage, Is Colorful Novelty 66
Shims Cut from Old Gaskets..... 299
Shingle Nails, Copper Steel, are Rust Resisting ..... 286
Shingles, Composition, Serves as Tile or Flat Pattern ..... 743
Shingles, Package for, Reduces Loss in Shipping ..... 56
Shingles, Slate, Nail Holes for..... 221
Ship Bulkhead Doors, Fireproof, Made of Mahogany ..... 72
Ship Canal, Big, U. S. to Have Another, by Robert Morgan..... 387
Ship, Cement, by H. H. Windsor..... 29
Ship, Concrete, Wreck of, Shows Great Enduranoe ..... 15
Ship, Crumpled Bow, Saved from Sinking.. 505
Ship, Disabled 9,000 Ton, Towed 2,000 Miles 504
Ship—Flagship, British, Model of, on American Auto Truck..... 423
Ship Hulk Converted into Modern Coal Handling Plant for Bunkering Steamships 48
Ship "Kobenhavn," Sailing, to Compete with Ocean Steamships ..... 251
Ship—"Leviathan," Model of, Passes Shipping Board ..... 591
Ship—Liner, Large, Converted to Oil Fuel Burning ..... 189
Ship "Lusitania," Expedition to Salvage..... 53
Ship "Lusitania" to Have Memorial Float over Its Grave..... 202
Ship "Majestic," World's Largest, by Henry S. White ..... 42
Ship, Mother, and Brood of Submarine Chasers ..... 38
Ship "Olympic" Makes New Speed Record... 365
Ship Propellers, Cast Iron, Made Smooth by Enamel Coating ..... 890
Ship "Quest," Ill Fated, Returns from Antarctic ..... 912
Ship, Required Time for, to Find Its Position by Wireless Telegraphy..... 423
Ship Rudder, Double, New Form of, being Tested in Germany ..... 593
Ship, Runaway, by H. H. Windsor..... 359
Ship Tonnage Explained..... 948
Shipbuilding, Amount of, in American Shipyards ..... 902
Shipping Box, Ripe Fig, Does Not Injure Fruit ..... 108
Shipping Cases, Machine Quickly Forms and Prints ..... 252
Ships, Directional Wireless Waves for Guiding ..... 212
Ship's Draft, Scale for Weighing Cargo through ..... 60
Ships—First Class Accommodation at Second Class Rates ..... 188
Ships, Lookout Direction Indicator for Use on ..... 64
Ships, Maneuvers of, Necessary for Formation of Smoke Screens..... 536
Ships—Ocean Liners, Wireless Payments Now Made While Aboard..... 107
Ships, Phantom, of the Arctic, by Stratford F. Corbett ..... 346
Ships Receive Free Medical Advice by Wireless ..... 932
Ships, Scrapping by Idle Shipyards, by D. R. Lane ..... 740
Ships, Two 70,000 Ton, Plan to Build..... 746
Ships—Warships, Six American, to be Given to Poland by New Bill..... 567
Shipyard, Idle, Adapted to Undo Own Work, by D. R. Lane..... 740
Shipyards, American, Ships Built by..... 902
Shirt and Waist Protector for Auto Trips... 494
Shock Absorber, Auto, Works on Lever Principle ..... 260
Shock Loader Economical for Farmer..... 908
Shocker, Automatic Grain, Works Successfully ..... 173
Shoe, Blow Out, Long Lived..... 647
Shoe Guard Prevents Soiling and Damage... 817
Shoe Shining Footrest Swings Out of Way.. 530
Shoe Shining Stand, Bathroom Stool Contains ..... 114
Shoe, Sport, Leather Saddle Strap Converts Oxford into ..... 935
Shoes, Rubber Bathing, Protects Feet..... 442
Shoes—Sandals, Rubber, Made from Auto Tires ..... 227
Shooting Area, Public, Canada Increases.... 896
Shooting Gallery, How to Make for Toy Pistols ..... 804
Shop Machine, Combination, Has Variety of Uses ..... 366
Shotgun, Rotary Cement Kilns Cleaned with 737
Shovel, Lawn Edger Made from..... 153
Shovel, Locomotive Coal, Automatic Counters on ..... 66
Shovel, Steam, Endless Tread Traction Rig for ..... 764

Shoveling Stand for Corn..... 952
Show Players, Traveling, Automobile Bus for ..... 33
Showcase, Two Section, Aids Storekeepers.. 916
Shower Bath, Motor Bus, Speeds Washing.. 430
Shrine, Miniature Model of, Made by Hindu Monks ..... 95
"Shut Ins," Prizes Offered for New Occupations for ..... 163
Shut Off, Automatic, for Thresher Grain Spout ..... 142
Shuttle, Loom, Blasts of Compressed Air Replace ..... 677
Sickle Sections, How to Remove..... 324
Sickness, Sleeping, Cure for, by H. H. Windsor ..... 866
Sidewalk, Damaged, Replaced without Disturbing It ..... 436
Sidewalk, Long Sloping, Built in Form of Stairway ..... 274
Sidewalk, Nonslip Concrete, Made by New Method ..... 517
Sidewalks, Concrete Blocks for Protecting.. 161
Siding Gauge, Handy, How to Make..... 797
Sifter, Electric, for Sand and Soil..... 292
Sifter, Electric, for Straining Liquids..... 882
Sight, Gun, of New Design Easy to Manipulate ..... 112
Sight—Length of Time to See a Thing..... 614
Sign, Boundry Mark, at Salem, Mass..... 930
Sign, Huge Electric, Advertises the City of Bristol ..... 603
Sign, Inlaid Glass Club, Is Artistic..... 428
Sign, Railroad Crossing, Warns Motorists.. 766
Sign, Safety First, for Railroad Crossing in Nebraska ..... 274
Sign, Street, Has Numbers and Names of Street ..... 438
Sign, Warning, Wrecked Fire Engine Acts as ..... 75
Signal, Auto Stop, Entirely Automatic..... 539
Signal Device, Auto, for Day or Night Use. 272
Signal, Improved Warning, for Autos..... 244
Signal Lights, Street, that Flash Red, White and Blue ..... 275
Signal, Railway Crossing, Has Three Lights 889
Signal, Traffic, Has Spikes for Careless Drivers ..... 429
Signal, Traffic, Operated from Sidewalk.... 687
Signals, Safety First, for Railroad Crossing in Nebraska ..... 274
Signboard, Wireless Receiving Station Installed in, at Greenfield, Ind..... 931
Signposts, Historical Carvings on, in England ..... 694
Signs, A B C Traffic, at Dangerous Crossings in Detroit..... 931
Signs, Amusing, on Rival Repair Shop Windows ..... 735
Signs, Auto, Graphically Remind in Columbus, Ohio ..... 111
Signs, Hospital Rest Hour, to Warn Motorists ..... 110
Signs, Perforated Business, Made of Sheet Metal ..... 125
Signs, Taxicab Safety, Carried by Company. 174
Silk, Artificial, New Dye Colors..... 22
Silo Moved from One Farm to Another on Wagon ..... 332
Silos, Concrete, in Mexico for Storing Corn. 848
"Silvore," Prizes Offered for Name to Replace 655
Siphon Pump for Heavy Liquids..... 136
Siphon Support, Improvised, and Float..... 311
Sirup, Prune, Developed to Equal Maple Sirup 238
Skates, Roller, Cross Country Trip on..... 661
Skating Carnival, Roller, Held on Busy Street 228
Skein, Wagon, Babbitt Ladle Made from.... 465
Ski Slide Design, Laws of Mechanics Applied in ..... 513
Skid for Handling Heavy Boxes..... 954
Skid for Hauling Sorghum Cane..... 953
Skid for Removing Soil from Unbraced Excavation ..... 471
Skids, Factory Made Truck, Strong and Durable ..... 912
Skinning Tool, Electric, for Packing Houses 437
Skirts, Pleated, Pressing Easily..... 490
Sky, Realistic, for Stage Setting..... 821
Slag, Lightweight Concrete Made of..... 743
Slate Shingles, Nail Holes for..... 221
Sled, Air Propelled Ice, to Carry Passengers and Freight ..... 563
Sleeper, "Stag," for Men on Night Train.... 234
Sleeping Sickness, Cure for, by H. H. Windsor ..... 866
Slicer, Automatic Bread, Cuts Loaves Rapidly 884
Slicer, Egg, for Salads and Fancy Dishes... 442
Slicer, Fruit and Vegetable, Cuts Any Thickness ..... 935
Slicer, Sweet Corn, Has Adjustable Blade.... 934
Slide, Dissolving, for Stereopticon..... 288
Slide, Water Toboggan, New Summer Sport. 1
Sliderule Device Solves Trigonometric Formulas ..... 706
Sliderule, Magnifying Runner for..... 301
Sliderule, Special, Machine Time Calculated on ..... 269
Slippers, Detachable Rubber Heels for..... 606
Slippers, Rubber Bathing, Protects Feet.... 442
Slogan, Advertising, Oddity of Name Made.. 450
Slogan, Electric Truck, Prizes Offered for.. 983
Slot Jig, Self-Locking Drill Bushing for.... 623
Slotting Fixture, Screw, Rapid..... 301
Slug Adjuster, Linotype, Has Antifriction Roller ..... 609
Smoke Screens, Maneuvers of Destroyers Necessary for Formation of..... 536
Smokestack, Brick, Moved to New Site Eight Feet Distant ..... 720
Smokestack, Lightning Specially Attracted by ..... 706
Smokestack, Spiral, to Reduce Wind Stresses 561
Snake Catching Pursued for Profit and Pastime ..... 655
Snake Etiquette for Tourist and Camper, by John Edwin Hogg ..... 197
Snake—Rattlesnake, Live, in Window Display ..... 684
Snapshot Exposures, Timing ..... 156
Snowshoe, Metal, Designed for Children.... 605
Soaker, Grain, for Swine ..... 291
Soap Dish for Hanging on Side of Scrubbing Pail ..... 606
Soapstone Deposit Discovered Near Dryden, Ontario ..... 426
Society Aids Children in Study of Birds..... 357
Socket Attachment Accommodates Two Electrical Utensils ..... 771
Socket Wrench, Adjustable, How to Make.. 963
Socket Wrench for Connecting Rods..... 808
Socket Wrench, Gear Drive..... 243
Sod Cutting Machine for Trimming Along Sidewalk Border ..... 832
Soda and Water as Lubricant for Broaching Cast Iron ..... 298
Soda Fountain and Oil Tank Truck Combined ..... 61
Soil Crusher and Leveler Operates with Harrow ..... 717
Soil Tillage Data, Traction Dynamometer Gives ..... 594
Solder, Aluminum, Applied without Using a Flux ..... 270
Solder, Simple Device for Pulverizing..... 955
Soldering Bit, Double Point..... 289
Soldering Flux in Stick Offers Advantages. 858
Soldering Flux, Keeping Handy on Blowtorch ..... 135
Soldering Iron, Chemically Heated..... 862
Soldering Iron, Electric, How to Make..... 139
Soldering Iron, Rest for ..... 452
Soldering Job, Difficult, Simplifying..... 786
Soldering Machine, Electric, for Jewelers... 830
Soldier Grave, Unknown French, Chiefs of Colonial Troops Visit ..... 561
Soldier's Bureau becomes Largest Trade School ..... 338
Soot Screen for Open Windows..... 638
Sorghum Cane, Skid for Hauling..... 953
Sound Amplifier, Wireless, Made from Phonograph ..... 145
Sound Made Visible with Wireless Vacuum Tube ..... 424
Sound Vibrations, Photographic Records Made of ..... 407
Sounding Machine, Deep Sea, Driven by Motor ..... 761
Souvenir Cards, Small Mail Pouch for Mailing ..... 775
Souvenirs, Rheim Cathedral, Doughboys Urged to Return ..... 491
Soy Bean and Pea Thresher Used with Grain Binder ..... 280
Soy Bean Industry Imports Indicate Growth of ..... 864
Spark Intensifiers, Automobile, Explanation of ..... 325
Spark Plug Container for Autos..... 641
Spark Plug Holder, New, Prevents Fouling. 600
Spark Plug Intensifiers, Explanation of..... 325

Spark Plug, Self-Cleaning, by Causing Air Suction ..... 710
Spark Plug Terminals, Snap ..... 326
Spark Plugs, Sharpening Points of, Increases Efficiency ..... 805
Sparks, Emery, Catcher for ..... 306
Spectacle Lenses, Instrument Measures, by Light Waves ..... 700
Spectacles, Color and Shape, to Match Hairdress ..... 658
Spectacles, Colored Celluloid, Protects Motorists' Eyes ..... 162
Spectacles—Eyeglass Spring, Broken, Emergency Repair for ..... 801
Speed Changing Device on High Speed Drills 445
Speed Recorder, Hand, Gives Readings at a Glance ..... 568
Speeder's Athletic Field Is Huge Rock Pile. 274
Speedometer and Flow Meter Combined in One Instrument ..... 716
Speedway, Auto, Built Under Difficulties.... 730
Speedway, World's Fastest, Stages First Event ..... 910
Spigot, Oilcan, Handy and Saving ..... 147
Spindle, Lathe, Made from Pin Vise ..... 300
Spokes, Tractor Wheel, Repairing ..... 299
Spoon and Fork Combination ..... 607
Sports—Hunting Area, Public, Canada Increases ..... 896
Spotlights, Crystal Glass Reflectors for..... 112
Spray Pump, Garden Hose as Substitute for 318
Sprayer, Angular Nozzle, for Underside of Leaves ..... 567
Sprayer, Bottle, for Household Use ..... 115
Sprayer, Potato Plant, Mounted on Motorcycle ..... 226
Spraying Machine, Paint, Light and Compact ..... 727
Spraying Machine Strainer Prevents Clogging ..... 112
Spraying Outfit, Wheelbarrow ..... 143
Spraying System, Sanitary, for Optician's Counter ..... 252
Spreader for Split Auto Rims ..... 812
Spring, Artistic, on Lincoln Highway, Penn. 438
Spring Bushings, Worn Auto, Replacing.... 146
Spring, Coil, Wrench Made from ..... 300
Spring Control, Adjustable, for Small Autos 912
Spring, Hanger for Cut Films Made from... 152
Spring Retainer, One Piece, for Poppet Valve Stems ..... 119
Springs, Auto, Assembling and Replacing.. 144
Springs, Auto, Oiled in Effective Manner... 742
Springs, Auto, Oiling through a Tube..... 310
Springs, Auxiliary Coil, for Motor Trucks.. 697
Springs, Cage Valve, Compressor for..... 782
Springs, Four Point Suspension, on Auto Changed to Three Point ..... 431
Springs, Small Coil, Hardening ..... 469
Sprinkler, Lawn, Perforated Pipe ..... 468
Sprinklers, Portable, with Power Driven Pumps ..... 705
Sprocket Teeth, Recently Developed Hobs for Cutting ..... 44
Square Guide, Convenient, for Draftsmen... 588
Square, Plumb, and Rule Combination for Home Mechanics ..... 154
Squaring Clamp for Belt Ends ..... 460
Squirrel Collection, Finest, Kept in Beautiful Home ..... 569
Squirrel Stands Up and Eats from Man's Hand ..... 121
Staat, George F.:
Fishing the Ether, (Poem) ..... 492
Stadium, World's Greatest, being Built in England ..... 826
Stage Flash Papers, Varicolored, How to Make ..... 803
Stage Setting, Theater, Realistic Sky for... 821
Stain, Yellow, in Hardwood ..... 632
Stains, Plaster and Lime, Removing from Floors ..... 476
Stains, Removing from Ivory ..... 620
Stairs, Proper Angles and Dimensions for.. 470
Stairs, School, Has Low Risers for Small Children ..... 612
Stairway, Long Sloping Sidewalk Built in Form of ..... 274
Stake, Metal Camp Fire, Has Three Adjustable Racks ..... 769
Stamp, Consecutive Numbering, Made from Dater ..... 640
Stamp Invoicing Appliance for Rapid Accounting ..... 48
Stamp, Self-Inking, Homemade Stencils Used in ..... 446
Stamps, New Leeward Island, Depict Historical Error ..... 880
Stamps, Russian Letter, Worth 200,000 Rubles 394
Stand, Motorcycle, Simple and Easy to Operate ..... 717
Stand, Poultry Feed, Conveniently Arranged 899
Stand, Sanitary Display, Preserves Fruit.... 80
Stand, Swing, Used for Hanging Clothes.... 804
Stand, Typewriter, Made from Camera Tripod ..... 324
Staples, Hay Hook Used to Pull ..... 452
Starch, Hawaiian Tree Ferns Found to be Source of ..... 74
Starter Gears, Auto, Cleaning ..... 647
Starter Gears, Auto, Lengthening Life of... 640
Station, Chicago's Railroad, Amount of Electrical Energy for ..... 180
Station Semaphores, Interurban, Operated by Public ..... 85
Stations, Union and Central, Modernizing in Chicago, by Cleveland Gaines ..... 19
Statue, "Civic Virtue," on Trial in New York 14
Statue — Knight Templar, Huge Mounted, Erected at New Orleans, La. ..... 229
Statue, Stately Lincoln, Dedicated ..... 2
Statue, Theodore Roosevelt, Erected at Portland, Ore. ..... 580
Statuettes, Photographic, Made Realistic... 715
Steam Boiler for Model Engines ..... 643
Steam Cylinders, Drain and Relief Valves for 512
Steam Devices on Radiator Controlled as Desired ..... 450
Steam Plant, Multiple Draft Gauge for.... 254
Steam Shovel, Endless Tread Traction Rig for ..... 764
Steam Tractor, Small, Made by Boy ..... 120
Steam Valves, Lock for ..... 946
Steamer, Open Drawbridge Wrecked by.... 355
Steel Columns, Long, Effect Saving in Building ..... 93
Steel Disk Wheels Made in Light Weights.. 6
Steel Making Plant, Huge, to be Built in India ..... 417
Steel Mills Offer Financial Aid to Technical Students ..... 983
Steel, Oil should be Used Liberally When Milling ..... 137
Steel Plant to Develop Iron Resources in Africa ..... 94
Steel, Rate of Heating, Has Effect When Hardening ..... 170
Steel, Stainless, Electroplating ..... 795
Steel, Tough, Chipping Chisel for ..... 465
Steering Wheel Lock, Adjustable, for Autos 4
Stem, Spiral, Simplifies Oil Well Drilling... 232
Stems, Loose Pipe, Tightening ..... 316
Stenciling Colored Designs on Fabrics..... 978
Stencils, Homemade, Used in Self-Inking Stamp ..... 446
Step Plate, Auto, Is also Suitcase Carrier... 415
Steps, Proper Dimensions and Angles for... 470
Steps, Reinforced Concrete, Made in Units.. 896
Steps, School, Has Low Risers for Small Children ..... 612
Stereoptican, Dissolving Slide for ..... 288
Stereoscope, Small, to Aid Salesmen ..... 563
Stiffener, Cap, Prevents Sagging in Front.. 891
Stilts Have Adjustable Footrest ..... 943
Stockings, Silk, Liquid Preparation for Stopping "Runs" in ..... 733
Stone Crusher, Largest, Holds Full Wagonload ..... 563
Stone Cutting Saw of Unusual Proportions.. 16
Stone Formation Resembles Huge Postpile, by John L. Von Blon ..... 54
Stone—Sandstone, Decaying, Two Methods of Preserving ..... 423
Stool, Bathroom, Contains Shoe Shining Stand ..... 114
Stool, Light Collapsible, for Autos and Outing ..... 445
Stop Collar, Drill Press ..... 634
Stop, Safety, Automatically Acts as Belt Shifter ..... 239
Stop Signal, Auto, Entirely Automatic..... 539
Stop Signal, Auto, Utilizes Tail Light..... 884
Storage Batteries, Lead Welding Outfit for.. 542
Storage Batteries, New Lightweight, Now Made ..... 436
Storage Battery Cell Filler Prevents Overflow ..... 614
Store, New York, Deepest Rock Excavation for, by T. Benjamin Faucett ..... 384

Store Recreation Spot, Book, in Pasadena, Calif. 110
Stores, Extension Hand for 291
Stores, Two Section Showcases for 916
Storm—Tornado in Greater New York 195
Stove Burner, Gas, Cooks and Heats Water at Same Time 34
Stove Burners, Gas, Rules for Testing 407
Stove, Camp, Has Detachable Oven and Perforated Plate for Embers 607
Stove, Electric, for Making Toast, Coffee, and Frying 279
Stove Firepot as Lawn Vase 156
Stove, Gas, Has Efficient Method of Combustion 556
Stove—Heater, Orchard, Burns Carbon Briquettes 368
Stove, Huge, and Shelter for Motorists, Seattle, Wash. 603
Stove Lid Lifter Hole Drilled for Finding in the Dark 802
Stove, Magazine, Burns Sawdust as Fuel 910
Stove, Portable Cook, Burns Denatured Alcohol 104
Stove, Sand Drying, Strongly Built 608
Stove Valve, Gas, Design of, Is Radical Departure 609
Stovepipe, Strawberry Runner Cutter Made from 155
Stowaway, First Aerial, Arrives in Cleveland 502
Straightedge, Steel, Preventing from Slipping 790
Strainer, Fruit, Eliminates Stained Hands 443
Strainer Funnel Has Adjustable Screens 771
Strainer, Spraying Machine, Prevents Clogging 112
Strap, Leather Saddle, Converts Oxford into Sport Shoe 935
Straps, Pack Sack, Improving 484
Strawberries, Preserving Fresh Saves Crop 379
Strawberry Runners, Cutter for 155
Street Car Loading Platforms in Los Angeles, Calif. 602
Street Car Stops Controlled by Color Scheme 24
Street Car, Subway, and "L" Systems Combined, by Geo. F. Paul 750
Street Car Track Header Curb Protects Pavement, by Harlan H. Edwards 253
Street Cars, Benefit of, Baltimore Railway Model Shows 732
Street Cars, Real, for Kiddies to Play In 668
Street Pavement, Wood, Dustless and Silent 354
Street Paving Material, Worn Out, Recrushed for Ballast 176
Street Pipe Laid without Excavation 276
Street Sign Has Numbers and Names of Street 438
Street, South Water, Modernizing in Chicago, by Cleveland Gaines 19
Street Traffic Post Has Spikes for Careless Drivers 429
Streets, City, Vacuum Cleaning Apparatus for 888
Stretcher, Wire, How to Make 804
Strike Plate, Door Lock, Adjustable 773
Strong Boxes, Loud Sounding Alarm Safeguards 738
"Strong Man" Lifts Truck in Movie Comedy 192
Strong Man Supports Eight Men and Framework 345
Stub Holder, Check Book, Leaves Both Hands Free 61
Students, Technical, Steel Mills Offer Financial Aid to 983
Stuffing Boxes, Metallic Packing for Use in 96
Stump, Cedar, Is Reservoir for Water System 402
Stumps, Air Blast Outfit Quickly Burns 705
Stumps 10,000 Years Old, by Francis W. Wilson 825
Stunt—Strong Man Supports Eight Men and Framework 345
Stunt, Thrilling Balloon, by European Dare Devil 922
Submarine Cable, Unusual Method of Laying 382
Submarine Chasers, Mother Ship and Brood of 38
Submarine Engines, German, Drive English Light Plant 263
Submarine Salvaged to Sink It, by Edward G. Maxwell 863
Submarine "S-51" Completes Its Test Successfully 244
Submarines, Two, Added to U. S. Navy 357
Subway Lights, Flickering, New Shoe Remedies 437
Subway, Surface, and "L" Systems Combined, by Geo. F. Paul 750
Suck Hole Leakage, Stopping in Rock Filled Dams 86
Suction Machine, Cotton Boll Weevil Destroyed with 193
Sugar Beet Harvester, Automatic 543
Sugar Beet Waste Utilized to Increase Yield 748
Sugar Cane Industry, Improved Process Devised in 206
Sugar Cane Mill, Primitive, Made of Wood 108
Sugar Cane Mill, Small, Large Water Wheel Drives 65
Sugar, Paraguayan Herb New Source of 768
Suitcase Carrier and Auto Step Plate Combined 415
Suitcase, Heavily Loaded, Shows Great Strength 531
Suitcase, Motor Picnic Kit Made from 325
Suitcase Outfit, Lighting Principles Shown in 239
Sulphuric Acid, Simple Process for Making 376
Support Prevents Sagging and Kinking of Soft Hats 279
Supporting Rig for Weakened Horse 432
Surgery, Advancement of, Prizes Offered for 163
Survey Work, Geodetic, Millionth of Second Counts in 984
Surveyor's Tape Made of Rope 790
Sweaters, School Girls Knit for Prizes 613
Sweet Corn Slicer Has Adjustable Blade 934
Sweet Pea Trellises Serve as Clothesline Posts 743
Swill Trough, Improved, for Swine 792
Swimmer, Small Girl, Tows Boatload of Men with Hands Tied 777
Swimmer, Strong, Tows Boat with Seven Passengers 424
Swimmers, Two Japanese, Swim Great Yangtze River 408
Swimming Belt Gives Free Arm Action 279
Swimming Device Fits Over Body like Suspenders 944
Swimming in Wading Boots 485
Swimming Pads, Air Filled, Give Free Arm Action 203
Swimming Pool Flotsam, Skimming from the Surface 461
Swing Stand Used for Hanging Clothes 804
Swiss Cheese, X-Ray Machine for Examining 738
Switch Brightens Auto Headlights 489
Switch, Dead End Wireless, for Inductances 982
Switch, Four Way, Made from Old Auto Timer 975
Switch, Jack, and Rheostat Combined for Wireless 706
Switch, Knife, Made from Old Snap Switch 645
Switch, Safety, Prevents Tractor from Turning Backward 270
Switch, Three Pole Double Throw, Homemade 487
Symphonic Composition, Best, Prizes Offered for 655

T-Bolt, Split, How to Make 616
T-Square Guide, Convenient for Draftsmen 588
Table, Breakfast Nook, Improved 146
Table, Collapsible, Handy for Camp and Picnic 904
Table, Computing, for English Exchange 624
Table, Dining, Made from Small Gate Leg Table 803
Table, Drawing, Convenient Folding 615
Table Leaves, Extra, Storing 642
Table, Metal Dressing, Is Sanitary 934
Table, "Pick Up," Speeds Handling of Mail 726
Tablets, Abraham Lincoln, Erected at Various County Seats 580
Taillights, Yellow, May Replace Red on Autos 91
Tank, Auxiliary Auto, Used as Footrest 738
Tank, Concrete, Water Tight Pipe Connection for 627
Tank, Dipping, for Brick or Tile 787
Tank, Handy Gasoline, for Garage Repair Work 247
Tank Heaters, Electric, Straps to Side of Tank 538
Tank Mixer Stirs Contents with Vertical Motion 598
Tank, Oil, Salesman Opens Office in 719

Tank Protector, Gasoline, Odd Appearing.. 514
Tank Trucks, Gasoline, Safety Valves on Faucets of ..... 928
Tank Tube, Gasoline, Prevents Explosions.. 611
Tanks, Buried Oil, Corrosion of..... 784
Tanks, Combination of Five, Placed on Motor Truck ..... 185
Tanks, Large Oil, Erected in New Zealand.. 900
Tanks, Leaking Water, How to Repair..... 323
Tanks, Oxygen and Acetylene, Handling of 797
Tanks, Wireless Equipped, Latest War Machine ..... 927
Tanks, 1,000 Gallon, Large Flower Vases Watered by ..... 906
Tape, Rubber and Friction, Combined in One Roll ..... 673
Tape, Surveyor's, Made from Rope..... 790
Tape Tunnel of the Bureau of Standards... 573
Taper Reamer, Piloted ..... 288
Tapers, Micrometer Attachment for Measuring ..... 140
Tapping and Drilling Machine, Combined Multiple ..... 546
Tapping, Hand, on a Sensitive Drill..... 457
Tar Heater Ignites Wood through Sand.... 921
Target, Animated Rifle, New York Police Department Has ..... 827
Tax Assessment Maps, Aerial, are Convenient ..... 208
Taxi, Free, Furnished by Hotel for Luncheon Guests ..... 232
Taxi Service, Airplane, at Croydon Air Station ..... 76
Taxicab, De-Luxe, Fitted Up Like Parlor Car ..... 712
Taxicab Safety Signs Carried by Company.. 174
Tea Set, Iridescent Glass, Resists Heat and Cold ..... 115
Tea Wagon, Electric Steam Radiator Heats 2
Teakettle, Aluminum, Has Separate Hole for Filling ..... 934
Teakettle, Safety Vent for..... 153
Teapot, Charcoal Heated, Common in China 658
Teapot for Melting Paraffin When Canning 315
Tears, Strange Substance in, Destroys Bacteria ..... 38
Teeth, False, Suction Valve for Maintaining Vacuum in ..... 531
Teeth, Nonskid False, Use Vacuum Cup Idea 572
Teeth, Rake, Clothespins Used as..... 145
Teeth, Sprocket, Recently Developed Hobs for Cutting ..... 44
Telephone Accessory Gives Privacy of Speech ..... 170
Telephone Camouflaged in Wall of Café.... 99
Telephone Circuit Sound, Remarkable Speed of ..... 82
Telephone Directory Hanger, Simple and Convenient ..... 749
Telephone Exchange, New York Police, Is Largest Private Exchange in the World.. 275
Telephone Headpiece Aids "Rewrite Men".. 349
Telephone Inventor — Alexander Graham Bell, Death of..... 529
Telephone Mouthpiece Prevents Eavesdropping ..... 63
Telephone Pad Holder and Desk..... 323
Telephone Receiver, New, Undistorted Sounds Given by ..... 852
Telephone, Transatlantic Wireless, Soon to be Achieved ..... 436
Telephone, Wireless, and Phonograph in One Cabinet ..... 210
Telephone, Wireless, by H. H. Windsor..... 30
Telephones, Free, on Highway Aid Motorists 425
Telescope Attachment Gives Three Magnifying Powers ..... 408
Telescope Reflector, Largest, Cast in America ..... 10
Temperature Indicator, Auto, Has Dial on Dash ..... 356
Template for Laying Out Keyways..... 298
Temple, Masonic Lodge, Built by Its Members ..... 178
Tennis Courts Covered with Roofing..... 610
Tennis Nets, Holding Taut..... 638
Tent and Pack Cover, Combination..... 473
Tent Outfit for Camping Is Compact and Collapsible ..... 241
Tent, Small Portable, as Beach Dressing Room ..... 884
Terminal, Canal, World's Largest, by Gordon P. Gleason ..... 264
Terminal, Chicago's Railroad, Amount of Electrical Energy for ..... 180
Terminals, Snap Spark Plug..... 326
Terraces, Protecting Grass Seed on..... 156
Test Indicator, Attachment Increases Usefulness of ..... 463
Tester, Improved, Tells Workability of Metal ..... 758
Tester, Linen, Has Pointer for Counting Threads ..... 831
Testing Block, Precision ..... 454
Theater Applause Artificially Stimulated... 729
Theater, "Crying Room" for Babies Built in 557
Theater Flash Papers, Varicolored, Making for Stage Effects ..... 803
Theater Foundations, New, Placed While Players Perform, by Everett J. Lovett... 25
Theater, Portable, "One Night Stand" Played by ..... 666
Theater Stage Setting, Realistic Sky for... 821
Theater, Vancouver, Beats High Cost of Ground ..... 676
Thermometers, Electrically Heated Bath Tests ..... 180
Thread Chasers, Chamfer Grinder Fixture for ..... 534
Thread Cutting Compound, Good..... 303
Thread Cutting Device Attachable to Any Lathe ..... 853
Threading Arbor, Special ..... 465
Threads, Cleaning with Beveled Bolt..... 302
Thresher Grain Spout, Automatic Shut Off for ..... 142
Thresher, Pea and Soy Bean, Used with Grain Binder ..... 280
Ticker, New Stock Exchange, Increases Speed ..... 186
Tide Gauge, Bridge, Helpful to Navigators 746
Tiering Machine Does Numerous Kinds of Work ..... 585
Tile and Brick, Dipping Tank for..... 787
Tile, Concrete, How to Make..... 779
Tile, Concrete, Standardization of Methods Improves ..... 93
Tile, Decorative, Resembles "Jazz" in Music 263
Tile Strength Demonstrated by Convincing Tests ..... 221
Tilter, Auto, Aids Repair Workmen..... 345
Timber, Great Britain's, being Restored by Government ..... 563
Timbers, Long Bridge, Ingenious Rig for Hauling ..... 582
Time—Second, Millionth of, Counts in Geodetic Survey Work ..... 984
Time Study Work, New Machine Facilitates 696
Timing Mechanism, Electric, for Various Uses ..... 72
Timothy, When to Harvest for Hay..... 469
Tin, Knife for Cutting..... 617
Tinfoil, Brittleness of, Traced to Aluminum 940
Tips, Neat, for Electric Wires..... 152
Tire and Wheel Lock, Automobile, Safeguards Valve ..... 933
Tire Blow-Out Shoe, Long Lived..... 647
Tire Blow-Outs, Plugs and Patches for..... 939
Tire Carrier, Spare, Lifts Heavy Metal Wheels ..... 86
Tire Casings, How to Keep Water Out of... 976
Tire Chain Bag, Handy, for Autos..... 106
Tire Chains, Auto, Aid for Applying..... 645
Tire Chains, Automobile, Vacuum Cup..... 53
Tire Filler, Fool Proof, Prevents Accidents 710
Tire, Improved Cord, Cotton Replaced by Hemp in ..... 724
Tire Mold, Adjustable, for Any Size Tire... 734
Tire Plates for Mending Rim Cuts..... 696
Tire Press Bracket Hoist Saves Time and Labor ..... 37
Tire Pump Used for Blowing Lamp Burners 624
Tire Repairmen's Fabric Knife..... 947
Tire Valves, Leaky, Method of Testing..... 152
Tires, Auto, Harness Made from..... 477
Tires, Auto, How to Carry..... 478
Tires, Auto, Machine for Wearing Out..... 177
Tires, Auto, Rubber Sandals Made from.... 227
Tires, Chest for Storing..... 967
Tires, Fabric Auto, Amount of Power Loss in ..... 95
Tires, Railroad Car Wheel, Electrically Heated and Fitted by Shrinkage..... 933
Tires, Rubber Wheelbarrow, How to Make.. 324
Title, Best Picture, Pearl Necklaces Offered for ..... 983

Toaster, Electric Heater Also Used as..... 935
Toaster, Electric, Turns Both Slices at Once 607
Tobacco Case, Combination, and Pipe Filler 517
Tobacco Gathering Machine Saves Hand Labor ..... 85
Toboggan, Water Slide, New Summer Sport 1
Toe Board, Safety, for Freight Car Truckmen ..... 50
Tomb, Interesting Chinese, in New Orleans 929
Tombs, Ancient, Work of Exploring, by F. N. Hollingsworth ..... 595
Ton, Weight of, Suggest Term to Designate 116
Tone Amplifiers on Upright Pianos..... 440
Tone Vibrations, Photographic Records Made of ..... 407
Tong Rack, Improved, for Blacksmiths..... 955
Tongs for Placing Bolts ..... 963
Tonnage, Ship, Meaning of ..... 948
Tool Carrying Attachments for Carpenters 512
Tool Holding Attachment for Grinding Machines ..... 533
Tool Rack, Convenient, How to Make..... 977
Toolholder, Accurate Box ..... 141
Toothbrush Has Separate Part for Cleaning Rear Side of Teeth..... 278
Toothbrush Holder also Holds Paste..... 279
Toothbrush, Hollow Handle, Contains Paste 443
Toothbrush, Rubber ..... 115
Top, Spinning, Teaches Arithmetic to Children ..... 450
Tornado in Greater New York..... 195
Torpedo Boats, Small Speedy, Navy Acquires 497
Touring, Auto Baggage Trailer for..... 63
Touring Truck, Automobile, Has Many Comforts ..... 188
Tourists, Camp for, in Seattle, Wash..... 603
Tourists' Caravansary Is New Industry, by Lawrence Wm. Pedrose ..... 523
Tourists' Motor Truck Fully Equipped..... 724
Tournament, Horseshoe Pitching, Annual... 491
Towel, Hole in, for Hanging..... 977
Tower, High, Foresters Climb as Daily Routine ..... 609
Tower, Memorial, in Honor of Lost Seamen 345
Tower, Tallest Concrete, for Japanese Wireless ..... 844
Towing, Auto, without a Towrope..... 310
Towing Axle, Stub, for Disabled Autos..... 103
Town, Model, Mariemont to be, by Walter Brinkman ..... 893
Town Moves Itself at a Profit, by Ivan E. Houk ..... 339
Toy Holder for Baby's Chair..... 278
Toy Vehicle, Children's, Used by Cripple.... 830
Toys, Ingenious, for Christmas Shoppers, by Stratford F. Corbett ..... 856
Toys:
Airplane, Cardboard, Wins Prize..... 285
Airplane Parts for Assembling..... 942
Airplanes, Model, How to Build..... 148
Balloon Can be Folded Flat or Inflated... 776
Balloons, Toy, Nonexplosive Gas Now Used for ..... 53
Bank Works on Wireless Principle..... 777
Bicycle Has Sidecar for Extra Passenger 943
Car, New Play, Has Clever Drive..... 353
Cat Has Luminous Eyes that Roll..... 943
Catapult, How to Make ..... 811
Crib, Doll, Made like Large One..... 120
Duck, Mechanical, Can Swim or Walk.... 777
Fan, Diminutive Revolving, Operated by Hand ..... 84
Motion Picture Machine, Homemade..... 981
Motorboat Made from Boxes Wins Prize.. 285
Scooter, Spring Seat, Has Roller Skate Wheels ..... 448
Shooting Gallery, How to Make for Toy Pistols ..... 804
Steam Boiler for Model Engine..... 643
Steam Tractor, Small, Made by Boy..... 120
Top, Spinning, Teaches Arithmetic to Children ..... 450
Tractor, Farm, How to Make..... 309
Typewriter, Child's, Prints Letters and Pictures ..... 40
Wagon, Boy's Auto, for Errands and Newspapers ..... 121
Water Scooter, How to Make..... 651
Water Skate, How to Make..... 161
Tracing Cloth, Cleaning with Gasoline..... 300
Tracting Cloth, Stretching Properly..... 288
Traction System, Continuous Tread, for Hauling Logs ..... 79
Tractor Clutch Yoke, How to Repair..... 959
Tractor, Crane Attached to, Aids Farmer... 921
Tractor, Device Converts into Trench Digger 885
Tractor, Device Prevents from Turning Backward ..... 270
Tractor Dump Wagons, Oversize, for Road Building Work ..... 328
Tractor Dynamometer Gives New Soil Tillage Data ..... 594
Tractor, Farm, Emery Wheel Attachment for ..... 565
Tractor, Football Team Holds for "Downs" 840
Tractor, Front End of, Increasing Weight of ..... 134
Tractor, Gasoline, Pulls Four Mowers at Once ..... 60
Tractor, Large Tree Removed with..... 436
Tractor, Radiator Guard for..... 618
Tractor, Rotary Pump for Use on..... 729
Tractor, Sanitary Breathing Pipe on..... 403
Tractor, Small, Changed into Locomotive... 256
Tractor, Small, Converted into Road Roller 932
Tractor, Small Steam, Made by Boy..... 120
Tractor, Soft Ground, Propelled by Feet.... 521
Tractor, Toy Farm, How to Make..... 309
Tractor, Truck Convertible into..... 399
Tractor, Warm Meals for Patients Hauled by ..... 84
Tractor Wheel Spokes, Repairing..... 299
Tractor, Winch on, Performs Heavy Labor 39
Tractor, Wire Fences Stretched with Aid of 500
Tractor, Wood Saw Fits Front of..... 178
Trade School, Veterans' Bureau becomes... 338
Trading Post, Famous, Now Airplane Station ..... 669
"Traffic Maps," School, Guide Pupils through Building ..... 715
Traffic Police, Hand Operated Horn for..... 441
Traffic Signal Has Spikes for Careless Drivers ..... 429
Traffic Signals Operated from Sidewalk.... 687
Traffic Signs, ABC, at Dangerous Crossings in Detroit ..... 931
Trailer, Auto Baggage, for Touring and Camping ..... 63
Trailer, Motor Truck, Moves 80 Houses 11 Miles ..... 759
Trailer, Motorcycle, How to Make..... 785
Trailer, Tourists' Auto, Makes Camping Easy ..... 714
Train, Night, Has "Stag" Sleeper for Men.. 234
Train Wreck, India, the Result of Plot..... 52
Training Camp Established for Army Balloon Pilots ..... 937
Tramway, Far North, Has Longest Cable, by F. H. Mason ..... 217
Transformer, Electrical, for Heating Railroad Car Wheel Tires..... 933
Transformer, New Type, for Direct Current 598
Transformer, Wireless Amplifying, Good for Broad Range ..... 270
Transformers, Small Single Phase, How to Make ..... 293
Transmitting Set, Wireless, How to Make.. 488
Transportation System, Combined, for Cincinnati, by Geo. F. Paul..... 750
Trap, Air Cleansing Dust, for Auto Carburetors ..... 379
Trap, Animal, Catches Humanely..... 330
Trap Gun, Gophers Commit Suicide with... 605
Trapper's Roadside Market Monopolizes Profits ..... 232
Trash Can, Easily Dumped..... 947
Travel, Different Modes of, in Central Australia ..... 552
Traveler, Steel, on Barge Aids Bridge Work 403
Traveling Bag, Leather, Has Side Compartment for Handy Articles..... 278
Tray, Crumb, Has Roller for Gathering Crumbs ..... 279
Tray, Developing, Made of Paraffin..... 974
Tree, Apple, Enclosed in Fence Is Oldest in Northwest ..... 439
Tree Buds, Seedless Apple, to Propagate New Variety ..... 103
Tree Crashes through Roof of Red Lion Inn ..... 195
Tree, Falling, Kills Horse and Misses Driver 549
Tree, Falling, Narrow Escape of Two Cars from ..... 242
Tree Ferns, Hawaiian, Found to be Source of Starch ..... 74

Tree, Japanese Pine, Trained to Form a Boat ..... 28
Tree, Large, Tractor Removes..... 436
Tree, Linemen Balked by, Cut through Foliage ..... 725
Tree Problem, Solving for City Dwellers... 257
Tree Pruning, Long Handled Chisel for.... 94
Tree Roots, Imperiled, Method of Protecting 768
Tree Seeds Live through Forest Fires, by W. I. Hutchinson ..... 901
Tree, Span of Human Life Compared with.. 174
Tree Stumps 10,000 Years Old, by Francis W. Wilson ..... 825
Tree, Unsightly Trimmed, on Lincoln Highway ..... 14
Trees, Citrus, Root Fungus Treatment Saves 416
Trees, Fruit, Injured by Winter Sun..... 952
Trees, Infected Chestnut, Durability of, As Timber ..... 752
Trees, Poplar, Near Sidewalk "Outlawed" in Detroit ..... 892
Trees, Young, How to Water..... 478
Trellises, Sweet Pea, Serve as Clothesline Posts ..... 743
Trench Digger, Device Converts Tractor into 885
Trick—Dice, Thought Transference with... 808
Trick—Truck, Strong Man Lifts, in Movie Comedy ..... 192
Tricks, Card, Two Effective..... 813
Trigonometric Formulas, Slide Rule Device Solves ..... 706
Trimmer, Book, Improved Continuous..... 508
Trimmer, Lawn, Made from Shovel..... 153
Trimming Machine, Hedge, One Man..... 9
Triplane, Tandem, Has Noteworthy Features ..... 175
Tripod, Camera, Typewriter Stand Made from ..... 324
Tripod Head, Tilting, Aids Motion Picture Men ..... 18
Trolley Cars, Real, for Kiddies to Play In... 668
Trolling Rig for Autumn Lake Trout..... 653
Trophies, Mine Rescue, Money Expended for 393
Trot-Line, Taking Up ..... 646
Trouble Lamp, Auto, Installing under Dash 154
Trouble Lamp, Auto, Used as Headlight.... 818
Trouble Light, Auto, Headlight Serves as.. 475
Trough, Improved Swill, for Swine..... 792
Trouser Press, Homemade ..... 816
Trout, Autumn Lake, Trolling Rig for..... 653
Truck Brings Ready Cooked Meals to Homes 585
Truck Cab, Lumber, Resembles Miniature House ..... 269
Truck Convertible into Tractor..... 399
Truck Delivers Gas, Oil, and Air from House to House ..... 533
Truck, Dumping, for Parcels in Chicago Post Office ..... 338
Truck, End Dumping Body, Mounted on Legs or Rollers ..... 78
Truck, First Commercial, to Use Wireless Equipment ..... 109
Truck Has Elevating Body for Dumping... 590
Truck, Highway Maintenance, Has Complete Equipment ..... 102
Truck, Motor, Combination of Five Tanks Placed on ..... 185
Truck, Oil Tank, Soda Fountain Combined in 61
Truck, Patriotically and Skillfully Adorned 381
Truck, Road Maintenance, Has Scraper Attachment ..... 49
Truck, Roller, for Farm or Factory..... 455
Truck Skids, Factory Made, Strong and Durable ..... 912
Truck Slogan, Electric, Prizes Offered for.. 983
Truck, Steel, for Enameled Flywheels..... 453
Truck, Strong Man Lifts in Movie Comedy.. 192
Truck Turntable Speeds Road Construction 547
Truck Wheel Lock, How to Make..... 964
Truck Wheels, "End Grain" Wooden..... 944
Trucks, Gasoline Tank, Safety Valves on Faucets of ..... 928
Trucks in Tandem Formation Delivered by One Driver ..... 234
Trunk Astray in Shipping Eight Years.... 337
Tube, Gasoline Tank, Prevents Explosions.. 611
Tuberculosis Patients, Tractor Hauls Warm Meals for ..... 84
Tubes, Gauge for Marking..... 453
Tubes, Inner, Air Release for..... 315
Tubes, Inner, for Protecting Plane Cutters. 300
Tubes, Pneumatic Mail, in New York to be Reopened ..... 878
Tubes, Thin, Chucking without Distortion.. 471
Tubing, Fabric Ventilation, Undergoes Severe Test ..... 170
Tubing, Steel Lighting, Comes Already Wired ..... 898
Tumble Drum Shows Advantage of Snug Packing ..... 194
Tumbler Made from Keg..... 301
Tuner, Wireless, Light and Compact..... 687
Tungsten Arc Lamp Has One Point Light.. 58
Tunnel, English Channel, Boring of, to See New Methods ..... 402
Tunnel, Large Wind, Tests Airplane Models 721
Tunnel, Long, to Pierce Continental Divide, by E. C. MacMechen ..... 361
Tunnel, New Type Wind, for Testing Airplanes, by Bernard G. Priestley..... 77
Tunnel to Replace Aerial Bridge at Duluth 733
Turbine and Dynamo Units for Train Illumination ..... 875
Turbines, Gas and Hydraulic, European Progress in ..... 166
Turntable, Inclined, for Narrow Gauge Railroad ..... 577
Turntable, Locomotive, 100 Feet Long..... 280
Turntable, Motor Truck, Speeds Road Construction ..... 547
Turret, Lathe, Held in Tailstock..... 956
Type, New, Permits Sightless and Seeing to Correspond ..... 520
Typesetting a Big Task on Chinese Newspaper ..... 246
Typesetting Machines, Automatic Lighter for ..... 305, 983
Typewriter, Ballet Dancer Performs on..... 4
Typewriter, Child's, Prints Letters and Pictures ..... 40
Typewriter, Early, Different from Modern Type ..... 276
Typewriter, Electric Light on, Aids Deaf Operator ..... 760
Typewriter Eraser, Holder for..... 322
Typewriter Keys, Broken, Sealing Wax for 652
Typewriter, Manifolding Aid for..... 639
Typewirter Paper and Carbon Sheets, Cabinet Holds ..... 373
Typewriter Stand, Homemade..... 642
Typewriter Stand Made from Camera Tripod 324
Typewriter, Standard and Word Writing, Aids Speed ..... 166
Typewriting by Wireless, by H. A. Lane.... 689

Umbrella Ribs, Tools Made from..... 137
Umbrella, Wireless, Has Detachable Parts. 494
University Campus, Wooden Police Guard.. 356
University City in Paris Planned..... 246
Upholstering Nails, Enameled, Used to Make Flag ..... 431

V-Blocks, Adjustable, from Pipe Fittings... 781
Vacuum Bottle Corks, Repair for..... 478
Vacuum Cleaner, Clothes Cleaned with..... 155
Vacuum Cleaner, Lighting Fixtures Protected While Using ..... 490
Vacuum Cleaner, Powerful, Mounted on Wheels ..... 354
Vacuum Cleaners Used on Cotton Looms.... 941
Vacuum Cleaning Apparatus for City Streets 888
Vacuum Cup Automobile Tire Chains..... 53
Vacuum Pump, Simple and Effective..... 778
Vacuum System, Auto, Testing for Leaks... 483
Vacuum Tube, Wireless, Sound Made Visible with ..... 424
Vacuum Tubes, Wireless, Adjusting to Voltmeter ..... 484
Vacuum Valve, Automatic, Is Easy to Remove ..... 354
Valve, Automatic Gas Meter, Reduces Damage by Fire ..... 933
Valve, Automatic Vacuum, Is Easy to Remove ..... 354
Valve, Clever Control, for Isolated Lights... 351
Valve, Gas, Design of, Is Radical Departure 609
Valve Grinder for Garages Has Speed and Accuracy ..... 868
Valve, Leak-Proof Radiator, without Packing ..... 72
Valve, Radiator, Controlled by Touch of Foot 944
Valve, Safety, for Gasoline Containers..... 875
Valve, Simple Radiator, Requires No Packing ..... 234
Valve Springs, Cage, Compressor for..... 782
Valve Stems, Oil Cup Inside Spring Lubricates ..... 116
Valve Stems, Poppet, One Piece Spring Retainer for ..... 119

Valve Wheel, Loose, Making Secure..... 472
Valves, Carburetor Needle, Repairing..... 638
Valves, Drain and Relief, for Steam Cylinders ..... 512
Valves, Gas Engine, Device Cleans without Removing ..... 282
Valves, Leaky Tire, Method of Testing..... 152
Valves, Overhead Engine, Tool Aids in Work on ..... 490
Valves, Safety, on Faucets of Gasoline Tank Trucks ..... 928
Valves, Steam, Lock for..... 946
Van, Moving, Patriotically and Skillfully Adorned ..... 381
Vaporizer, Gasoline, for Automobiles..... 368
Vaporizer, New Auto, Installed in Manifold. 180
Vapors and Gases, New Method of Cleaning. 920
Variable Condenser, Wireless, of Compact Design ..... 712
Variometer Winding Form, Wireless..... 975
Variometer, Wireless, Neatly Designed..... 352
Varnish, Wax Added to, Renders More Acid Resisting ..... 174
Vase, Collapsible Flower, for Long or Short Stems ..... 770
Vase, Lawn, Stove Firepot as..... 156
Vases, Large Flower, 1,000 Gallon Tanks Water ..... 906
Vault, Concrete Bank, Mining Tools Used to Strip ..... 64
Vegetable and Fruit Slicer Cuts Any Thickness ..... 935
Vegetable Display Stand, Sanitary, Also Preserves ..... 80
Vegetation, Mapping with Pantograph..... 745
Vending Machine, Sandwich, Keeps Them Fresh ..... 70
Vent, Safety, for Teakettle..... 153
Ventilating Fan, Kitchen, Easily Installed.. 576
Ventilation, Push Button, in London Building, by Henry S. White..... 660
Ventilation Tubing, Fabric, Undergoes Severe Test ..... 170
Ventilator, Automatic, for Auto Creates No Draft ..... 556
Ventilator Base Adjustable to Pitch of Roof 400
Ventilator, Fresh Air, without Draft..... 184
Ventilators, Furnace Registers Used as..... 152
Viaduct Arch, Artistic, in San Francisco, Calif. ..... 603
Viaduct Bridge Painted Checkerboard as Warning ..... 438
Viaduct Piers, Concrete, Replaced by Unusual Methods ..... 757
Vibrations, Sound, Photographic Records Made of ..... 407
Village, Model, Mariemont to be, by Walter Brinkman ..... 893
Village Moves Itself at a Profit, by Ivan E. Houk ..... 339
Village Site and Buildings Moved Two Miles 556
Vineyards, California, Perambulating Incinerators for ..... 708
Vinson, Curtis:
Refinery, Portable, for Use in New Oil Fields ..... 418
Violin as Phonograph Reproducer..... 637
Violin Finger Board, Corrugated, Aids Players ..... 569
Violin, Mammoth, Is Feature of Music Conference ..... 196
Violin or Walking Stick Interchangeable at Will ..... 202
Violoncello, Collapsible, Is Portable and Quiet ..... 337
Vise for Blacksmith's Anvil..... 464
Vise, Hand and Bench, Combined for Small Work ..... 963
Vise, Holding Round Work in..... 292
Vise, Homemade Piston ..... 302
Vise, Improvised Pipe ..... 457
Vise, Pin, Lathe Spindle Made from..... 300
Vises, Machine, Removable Jaws for..... 626
Voice, Boy's, Outranges Piano Keyboard..... 194
Voices of Distinguished Men, Odd Museum Records ..... 214
Voices Registered on Film for Speaking Movies ..... 83
Volcanoe, Active, Drilling Holes in, by Everett J. Lovett ..... 183
Voltmeter, Adjusting Wireless Vacuum Tube to ..... 484
Voltmeter, Battery Checking, of Handy Design ..... 6
Von Blon, John L.:
Postpile, Devil's ..... 54
Voters Use Boats to go to Polls in Flooded Town ..... 51
Vulcanizer, New Electric, for Dentists..... 897
Vulcanizing Attachment for Inner Tubes... 792
Vulcanizing Mold, Adjustable, for Different Size Tires ..... 734

Wagon, Boy's Auto, for Errands and Newspapers ..... 121
Wagon Skein, Babbitt Ladle Made from..... 465
Wagon, Tea, Electric Steam Radiator Heats 2
Wagon, Wind, How to Build..... 319
Wagons, Oversize Dump, for Road Building Work ..... 328
Waist and Shirt Protector for Auto Trips.. 494
Walking Chair, Invalid, Better Than Crutches ..... 248
Walking Stick or Violin Interchangeable at Will ..... 202
Wall, Solid Core, Prevents Undermining of Levee ..... 416
Wallboard Fastener, Self-Clinching..... 63
Walls, Concrete, Destroyed Pneumatically.. 758
Walls, Hollow Concrete, Form for Pouring in Courses ..... 715
Walls, Novel Method of Painting..... 946
Walrus Hides Valuable for Polishing Metal 830
War Memorial, Ornamental Church Window Is ..... 248
War "Shut-Ins" and Cripples, Prizes Offered for New Occupations for..... 163
War Victim, First French, Monument to..... 747
Wardrobe, School, Changes into Blackboard 601
Warning Signal, Improved, for Autos..... 244
Warships, Six American, to be Given to Poland by New Bill ..... 567
Wash Boiler, Faucet on, Aids in Emptying. 490
Wash Boiler Rack, Wire, Removes Clothes Easily ..... 443
Washbowl, Huge, Automobile Running Gears Washed in ..... 178
Washer Cutter, Simple, How to Make..... 960
Washing Machine, Attaching Electric Motor to ..... 318
Washing Machine Driven by Engine in Detached Building ..... 641
Washing Machine Sterilizes and Bleaches Clothes ..... 935
Waste Can, Easily Dumped..... 947
Watch Crystal Mirror ..... 148
Watch, Old Curious, Wins World's Fair Medal ..... 18
Watch Roller Jewels, Tool for Setting..... 213
Watch, Tiny, May be Used as Cuff Link..... 606
Water Barrel Regulator, Simple..... 638
Water Basin, Separate, for Household Supply 250
Water, Bathing Beach, Piping System to Purify ..... 211
Water Bottle, Hot, Instant Heat Chemical Bag as ..... 94
Water, City Drinking, Cooling..... 486
Water Colors, Old, Using..... 301
Water Drawing Gear of Ancient Days..... 376
Water, Drinking, for Cattle Obtained from Dew ..... 90
Water Gun Fire Engine Takes 12 Lines of Hose ..... 57
Water, Hard, Peat Softens..... 196
Water Heater, Electric, Fits on Faucet..... 892
Water Heating from Open Grate Fire..... 842
Water Impounding Project of Vast Proportions ..... 58
Water Jets and Pumps Used in Treatment of Peat ..... 48
Water Level Indicator for Auto Radiator... 277
Water Lifting Machine, New Self-Operating 331
Water Motor, Faucet, for Various Kitchen Duties ..... 279
Water Motor, Low Head, for Swift Current 678
Water Plant, Village, Automobile Engine Runs ..... 665
Water Power Plant Design Increases Efficiency ..... 526
Water Power Project, Alpine Lakes to Form Link in ..... 575
Water Pressure Per Square Inch..... 472
Water Scooter, Toy, How to Make..... 651
Water Separating Filter on Gasoline Feed Pipe ..... 270
"Water Skate," Toy, How to Make..... 161
Water Slide Toboggan a New Summer Sport 1
Water System, Cedar Stump as Reservoir for ..... 402

Water System, Settling Chamber for..... 618
Water Tanks, Leaking, How to Repair..... 323
Water Tanks, 1,000 Gallon, for Watering Large Flower Vases ..... 906
Water Wheel, Large, Drives Small Sugar Cane Mill ..... 65
Waterfall, World's Largest, Seldom Visited 65
Waterline, Boat, Drawing True..... 138
Watermelons Grown Under Hay, Straw, and Canvas ..... 748
Waterworks, British Guiana, of Unusual Characters ..... 928
Wax Added to Varnish Renders It More Acid Resisting ..... 174
Wax, Sealing, for Broken Typewriter Keys. 652
Weaning Device, Automatic, for Young Cattle ..... 557
Weather Bureaus, Amateurs, Do Good Service ..... 440
Weaving Device, Carpet, for Joining Rag Strips ..... 801
Wedge, Inexpensive Window, Stops Rattling 543
Wedge, Tool Handle, Retightened without Changing ..... 941
Weed Exterminator, Railroad Builds..... 262
Weed Uprooting Machine, Railroad..... 441
Weevil, Cotton Boll, Suction Machine Destroys ..... 193
Weight, Neat Paper, Contains Magnifying Glass ..... 107
Weight—Ton, Weight of, Suggest Term to Designate ..... 116
Welder, Electric Arc, Has Automatic Feed.. 378
Welding Clamp, Acetylene ..... 796
Welding Outfit, Lead, for Storage Battery Work ..... 542
Welding Outfits, Motorcycle Sidecars Transport in New Orleans..... 931
Welding, Preheating a Large Casting for... 141
Welding Rod Holder, Double..... 136
Well Water Drawing Gear of Ancient Days. 376
Whale Ambergris, 80 Pounds of, Worth Small Fortune ..... 95
Wharf, New Orleans River, Raising, by Thomas Ewing Dabney ..... 369
Wheat Cut, Threshed, Ground, and Cooked at One Time ..... 739
Wheatstone Bridge for Coil Winding..... 812
Wheel Dressers, Resetting Diamonds in.... 127
Wheel, Loose Valve, Making Secure..... 472
Wheel Pump, Novel, for Draining Marshland 597
Wheel Spokes, Tractor, Repairing..... 299
Wheel, Steel Logging, for Tractor Use..... 578
Wheelbarrow Heater for Repairing Roads.. 535
Wheelbarrow Spraying Outfit ..... 143
Wheelbarrow Tires, Rubber, How to Make. 324
Wheels, Compressed Canvas for..... 916
Wheels, Disk, Fan Attachment Cools..... 566
Wheels, Electric Prayer, Operated in India.. 86
Wheels, Enameled Fly, Steel Truck for..... 453
Wheels, "End Grain" Wooden, for Factory Trucks ..... 944
Wheels, Front Tractor, Increasing Weight of ..... 134
Wheels, Heavy Metal, Spare Tire Carrier Lifts ..... 86
Wheels, Steel Disk, Made in Light Weights. 6
Whipper, Electric Cream, Saves Labor..... 771
Whistle, Auto Radiator, Warns of Overheating ..... 673
White, Henry S.:
Mount Everest Summit Still Untrod by Man ..... 374
Musical Education, Scientific Methods Used in ..... 172
Ship "Majestic" Is World's Largest..... 42
Ventilation, Push Button, in London Building ..... 660
Wilson, Francis W.:
Locomotive, How Far Can It Jump?..... 674
Stumps 10,000 Years Old..... 825
Winch, Anchor Hoisting, for Seaplanes Tested by Navy ..... 896
Winch, Homemade Farm ..... 304
Winch Improvised from Lathe..... 290
Winch, Tractor, Performs Heavy Labor.... 39
Wind Scoop for Bedroom Window..... 162
Wind Tunnel, Large French, Tests Airplane Models ..... 721
Wind Tunnel, New Type, for Airplane Testing, by Bernard G. Priestley..... 77
Wind Wagon, How to Build..... 319
Winding Form, Wireless Variometer..... 975
Windlass, Homemade, for Farm or Shop.... 645
Windlass, Ratchetless, How to Make..... 625
Windmill Atop City Home Feeds Electric Lights ..... 824
Windmill, Controlling from the House..... 811
Windmill, Old Fashioned, Still in Operation 719
Windmills on Columbia River for Irrigation 888
Window, Bedroom, Wind Scoop for..... 162
Window Brush Has Compartment for Water 771
Window, Burglar Proof, Has Disappearing Bars ..... 920
Window Cleaning Bag Contains Granular Substance ..... 442
Window Curtain Holder with Adjustable Clamp ..... 114
Window Display, Clever, for Fishing Season 426
Window Display, Live Rattlesnake in..... 684
Window Frame, Hinged, Hanging from Inside ..... 790
Window Ledge Guard ..... 482
Window, Ornamental Church, Is War Memorial ..... 248
Window Sash, Method of Mounting..... 631
Window Shade, Mounting of, Allows Top and Bottom Ventilation ..... 644
Window Shade, Preventing from Tearing from Roller ..... 637
Window Shade Resembles Curtain on Inside and Shade Outside ..... 115
Window Shades, Waterproof Cloth Produced for ..... 283
Window Soot Screen ..... 638
Window Wedge, Inexpensive, Stops Rattling ..... 543
Windshield and Spotlights, Motorcycle Has. 503
Windshield, Automobile Rear Seat Cover Used as ..... 351
Windshield, Rear Seat, for Auto on Automatic Rollers ..... 579
Windsor, H. H.:
Accidents, Grade Crossing ..... 866
Airplane Speed of Four Miles a Minute.. 865
Art in Industry ..... 31
Cement Ship, The..... 29
Dirigible Disasters ..... 865
Dyes, American, Should be Encouraged... 701
Emigration, Rate of ..... 701
Fire Prevention, Teaching in Schools..... 29
Gliders a Fad..... 703
I. W. W., Good Work by..... 209
Lepers, What about The..... 360
Magician's Rights Recognized..... 702
Newspaper Postage Rate, Reduce..... 209
Philippines, Independence for The..... 359
Police, Mounted, for Highways..... 702
Revolvers Should be Abolished..... 703
Russia the Helpless ..... 360
Ship, Runaway ..... 359
Sleeping Sickness, Cure for..... 866
Wireless Fire Risk Avoidable..... 31
Wireless Telephone ..... 30
Wireless Wonders ..... 209
Windstorm in Greater New York..... 195
Wings, Airplane, Method of Testing by Flying in Air ..... 95
Winters, S. R.:
Highway Models for Engineering Colleges 907
Wire, Barbed, Fastening to Iron Posts..... 817
Wire Cables, Tool Holds and Cuts Easily... 408
Wire, Coils of, are Boxed Instead of Wrapped ..... 230
Wire, Electric, Neat Tips for..... 152
Wire, Electrical, Knot for, Protects Fixtures 619
Wire, Electrical, Putting Rubber Sleeving on 623
Wire, Fence, as Concrete Reinforcement... 968
Wire Fences, Tractor Aids in Stretching... 500
Wire, Fuse, Gaskets for Tight Joints Made from ..... 781
Wire Gauge, Novel ..... 617
Wire Stretcher, Simple, How to Make..... 804
Wireless Aerial, Electric Wiring in Homes Used as ..... 171
Wireless Aerial Pole Erected by One Man.. 366
Wireless Aerial, Ready Made, Now on the Market ..... 778
Wireless Amplifier, Phonograph Sound Box Used as ..... 688
Wireless Amplifier, Two Step Audio Frequency, How to Make..... 157
Wireless Amplifier, Universal, Aids Communication ..... 2
Wireless Amplifying Transformer Good for Broad Range ..... 270
Wireless Antenna, Insulator for..... 312

Wireless Antenna, Longest, Oregon Lumber Camp Boasts ..... 530
Wireless Antenna, Seaplanes Equipped with Kite to Carry ..... 96
Wireless, Army Tanks Equipped with..... 927
Wireless Automobile, Transcontinental, Makes Fast Trip ..... 508
Wireless Band in Student Parade..... 768
Wireless Block for Using Several Phones.. 816
Wireless Booths, Remote Control, for Arlington Station ..... 417
Wireless, Boy Scouts', Displaces City Band. 772
Wireless Buzzer, High Tone..... 654
Wireless Cage Antenna of New Type..... 652
Wireless Code Machine Makes Eleven Million Codes, by H. H. Dunn..... 849
Wireless, Concealed, on Auto Gives Concert While Driving ..... 425
Wireless, Cotton Goods Loom Operated by.. 892
Wireless Crystal Detector like Vacuum Tube 38
Wireless Crystals, Fusible Alloys for Setting 811
Wireless Crystals, How to Renew..... 966
Wireless Dead End Switch for Inductances. 982
Wireless Equipment, First Commercial Truck to Use ..... 109
Wireless Equipment, Portable, Set Up in Few Minutes ..... 600
Wireless Fan Coils and Mountings..... 498
Wireless Filament Rheostat Made of Carbon Disks ..... 38
Wireless, First Canadian Railroad to Install 212
Wireless, Free Medical Advice Sent Ships by 932
Wireless Interrupter, Neat, How to Make.. 976
Wireless Knobs Made from Storage Battery Plugs ..... 542
Wireless Loop Aerial Used in Steel Train.. 868
Wireless Loud Speaker, High Voltage, Needs No Batteries ..... 500
Wireless Loud Speaker, How to Make..... 805
Wireless Loud Speaker, Nonvibrating Material Used in ..... 182
Wireless Loud Speaker, Phonograph Used as ..... 450
Wireless Megaphone Is Also Diving Platform ..... 343
Wireless Messages, Secrecy of, Invention Promises ..... 37
Wireless, Motion Pictures and Photographs Broadcasted by ..... 824
Wireless, Motor Busses Equipped with..... 169
Wireless, Motor Truck, Displaces New York Hurdy-Gurdy ..... 5
Wireless Mounted on Motor Truck, by H. A. Lane ..... 662
Wireless, Office Building to be Wired for... 492
Wireless Outfits, Homemade, Described in Government Circular ..... 327
Wireless Payments Now Made While Aboard Ocean Liners ..... 107
Wireless, Photograph Sent by, from Rome, Italy, to Bar Harbor, Me..... 188
Wireless Plant, Sainte-Assise, Has World Wide Connections ..... 914
Wireless, Polished Case, for Home Use..... 770
Wireless Proposed for Police Stations..... 177
Wireless Receiver, How to Make..... 814
Wireless Receiver, Portable, How to Make.. 649
Wireless Receiver, Short Wave, Honeycomb Coils for ..... 313
Wireless Receiving Aerial, New Transatlantic, Strung on Telegraph Poles, by Bernard G. Priestley ..... 17
Wireless Receiving Apparatus Resembles Table Lamp ..... 177
Wireless Receiving Set, Clock Mounted on.. 611
Wireless Receiving Station Installed in Signboard at Greenfield, Ind..... 931
Wireless Rheostat and Jack Switch Combined ..... 706
Wireless Rheostat for Vacuum Tubes Has Good Qualities ..... 170
Wireless Rheostat Mounting, Novel..... 153
Wireless Service, Direct, to Australia..... 939
Wireless Service, Directional, of Short Wave Length ..... 57
Wireless Service, Quarter-In-Slot..... 710
Wireless Sound Amplifier Made from Phonograph ..... 145
Wireless Static, Government Remedies for.. 398
Wireless Station, Big, being Built Near Saigon in French Indo China..... 569
Wireless Station, Gigantic, Opened in Germany ..... 331
Wireless Station, Largest, in Central America ..... 737
Wireless Station, New Swedish, to be American Built ..... 521
Wireless Station, Private, Owned by Eight Firms ..... 419
Wireless Station, Private, Well Equipped, by H. A. Lane..... 662
Wireless Stations, Low Speed, to be Established by Government in India..... 562
Wireless Telegraphy, Time Required for Ship to Find Its Position by..... 423
Wireless Telephone and Phonograph in One Cabinet ..... 210
Wireless Telephone, Dog Listens In on..... 284
Wireless Telephone Fire Risk Avoidable, by H. H. Windsor ..... 31
Wireless Telephone, Simple Battery, How to Make ..... 979
Wireless Telephones, by H. H. Windsor.... 30
Wireless Telephony, Transatlantic, Soon to be Achieved ..... 436
Wireless Tower, Tallest Japanese, Made of Concrete ..... 844
Wireless Transmitting Set, How to Make... 488
Wireless Tuner, Light and Compact..... 687
Wireless, Typewriting by, by H. A. Lane... 689
Wireless Umbrella Has Detachable Parts... 494
Wireless Vacuum Tube, Sound Made Visible with ..... 424
Wireless Vacuum Tubes, Adjusting to Voltmeter ..... 484
Wireless Variable Condenser, Neat..... 356
Wireless Variable Condenser of Compact Design ..... 712
Wireless Variometer, Neatly Designed..... 352
Wireless Variometer Winding Form..... 975
Wireless Waves, Directional, for Guiding Ships ..... 212
Wireless Wonders, by H. H. Windsor..... 209
Wires, Charged, Danger in Playing Hose Stream on ..... 138
Wires, Drawn Fine, Composed of Single Crystal ..... 102
Wood, Apple, for Smoking Meats..... 477
Wood, Birch, Used as Fuel in Sweden..... 694
Wood—Chestnut Trees, Infected, Durability of, as Timber ..... 752
Wood — Douglas Fir and Southern Pine, Strength of ..... 780
Wood—Hardwood, Yellow Stain in..... 632
Wood Ignited through Sand by Tar Heater. 921
Wood Pavement, Durable, Is Dustless and Silent ..... 354
Wood, Police Made of, Guard Campus Grounds ..... 356
Wood Preservative, Poisons Mixed in Paraffin as ..... 913
Wood Preservatives, Testing Penetration of 798
Wood, Primitive Sugar Cane Mill Made of.. 108
Wood — Pulp Decay, Reducing by Proper Storage ..... 952
Wood Pulp, Stored, Decay in, Experimentally Prevented ..... 22
Wood, State Capitol Building Carved in..... 46
Wooden Screws Provided for Difficult Places 875
Woodwork, Interior, Salvaging ..... 298
Woodworking Machine, New, of Multifarious Uses ..... 113
Woodworking Outfit Contains Eight Machines ..... 283
Woolens, German Product Makes Moth Proof 416
Work, Eminent, Women Offered Prize for.. 491
Workbench, Adjustable Rest for..... 634
Wreck, Fire Engine, Acts as Warning Sign. 75
Wreck, India Train, Result of Plot..... 52
Wrecks:
  Airship Lands Crew in Sea..... 609
  Coal Train Deserted by Crew..... 404
  Concrete Ship Shows Great Endurance.... 15
  Ferris Wheel, New York, Blown from Its Moorings ..... 195
  Railroad Coaches Reduced to Kindling.... 495
  Steamer Runs into Open Drawbridge..... 355
  Tree Crashes through Roof of "Red Lion Inn" ..... 195
Wrench, Adjustable Socket, How to Make... 963
Wrench, Auto Rim, Has Four Sizes of Sockets ..... 58
Wrench, Emergency Pipe, File and Monkey Wrench as ..... 133
Wrench for Plugs ..... 792
Wrench Has Quick Adjustable Jaws..... 354
Wrench, Making from Coil Spring..... 300

Wrench, One Hand Pipe, Simple and Strong 122
Wrench, Pipe and Nut, Self-Adjusting..... 408
Wrench, Self-Adjusting, Grips at Any Angle 941
Wrench, Socket, for Connecting Rods..... 808
Wrench, Socket, Gear Drive..... 243
Wrench, Socket, Has Eleven Different Grips 527
Wrenches, Machine, Novel Holder for..... 962
Wristpin Centers, Lapping ..... 783
Writing on Glass ..... 148

X-Ray Equipment Improved for Medical Use ..... 891
X-Ray Machine, Swiss Cheese Examined with ..... 738
X-Ray Therapy, Precise Control of Dosage in ..... 882
X-Ray Tube and Plate Holder, Frame for.. 343

Yacht, American Model, Wins in International Race ..... 383
Yacht's Rigging, Automobile Repair Work Aided with ..... 551
Yoke, Tractor Clutch, How to Repair..... 959

Zoning Law, Illinois, Made Void by Court Decision ..... 568
Zoo Monkey Cage Has Hospital and Modern Conveniences ..... 943
Zoological Dams Serve Dual Purpose..... 380

# Popular Mechanics Magazine

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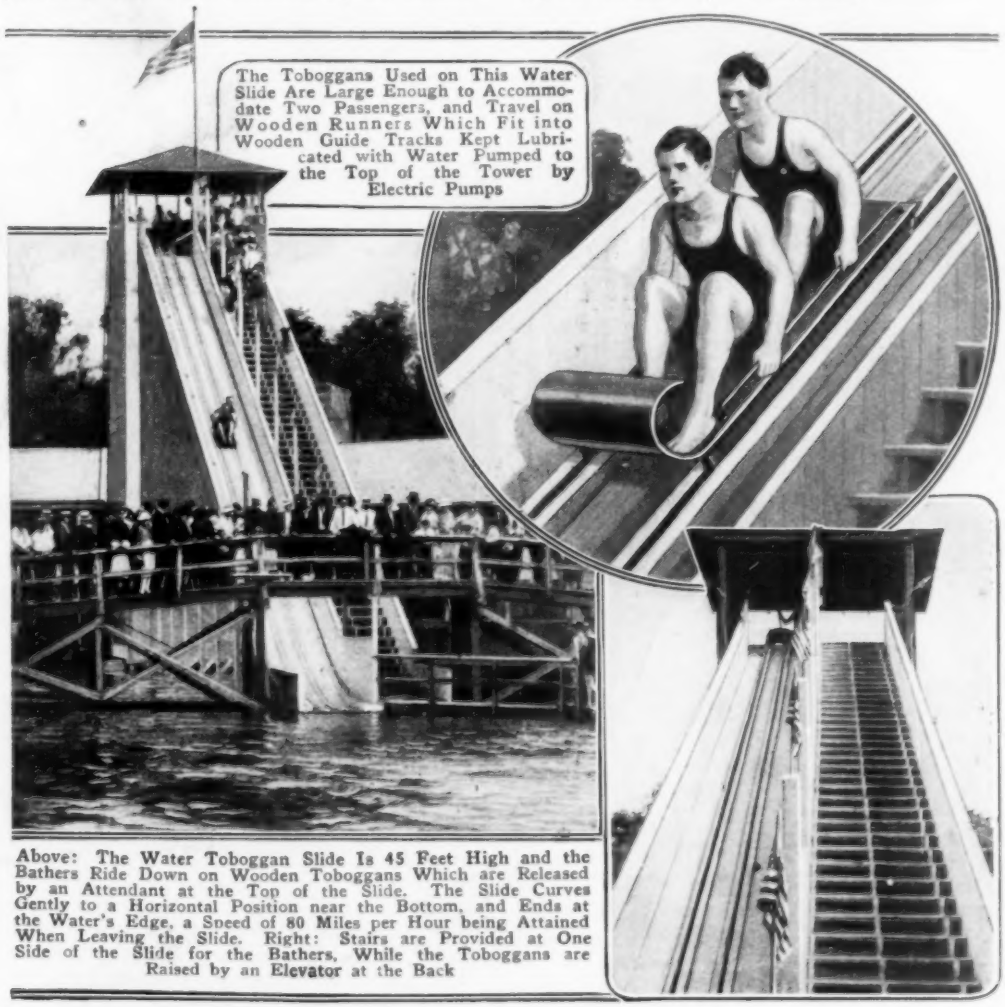
Vol. 38 JULY, 1922 No. 1

## Water-Slide Toboggan New Summer Sport

FASHIONED after the slides erected for the children at the beaches and parks, a water toboggan slide has been built at Sulphur Springs, near Tampa, Fla., which is claimed to be a real thriller. The chute is 45 ft. high and 125 ft. long, and ends in a gradual curve at the surface of the water. Bathers using the slide sit on wooden toboggans large enough for two persons, which are released by an attendant at the top of the slide. The toboggans slide on tracks that are lubricated with water, and attain a speed of 80 miles an hour by the time they reach the bottom of the chute. After leaving the chute, the toboggans often glide a distance of 200 ft. over the surface of the pond, and may be guided as one would guide a sled on the snow. The toboggans are returned to the top of the slide by an elevator.



The Toboggans Used on This Water Slide Are Large Enough to Accommodate Two Passengers, and Travel on Wooden Runners Which Fit into Wooden Guide Tracks Kept Lubricated with Water Pumped to the Top of the Tower by Electric Pumps

Above: The Water Toboggan Slide Is 45 Feet High and the Bathers Ride Down on Wooden Toboggans Which are Released by an Attendant at the Top of the Slide. The Slide Curves Gently to a Horizontal Position near the Bottom, and Ends at the Water's Edge, a Speed of 80 Miles per Hour being Attained When Leaving the Slide. Right: Stairs are Provided at One Side of the Slide for the Bathers, While the Toboggans are Raised by an Elevator at the Back

## ELECTRIC STEAM RADIATOR HEATS TEA WAGON

Serving tea from a copper-covered tray placed on a five-coil radiator heated by electricity, the whole being mounted on

Tea Wagon and Copper-Covered Tray, the Contents of Which are Heated by an Electric Steam Radiator

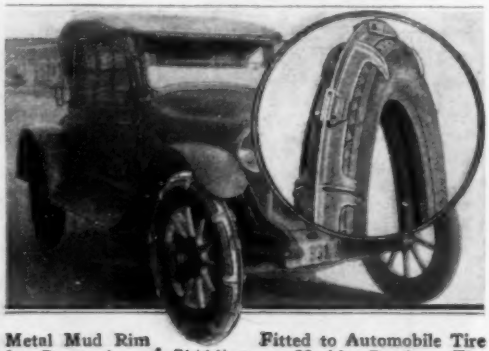
rubber-tired wheels, is the latest innovation in this line. The heating element is submerged in water in the bottom of the coils, and has the usual cord and plug for connection to any light socket. The outfit possesses a thermostatic attachment which regulates the steam pressure by switching the current off and on at certain temperatures, and with the apparatus electrically disconnected entirely, the food will remain for a half hour in a proper condition for serving.

## UNIVERSAL AMPLIFIER AIDS RADIO COMMUNICATION

Universal amplifiers for radio communication have lately been successfully tested by the Bureau of Engineering of the Navy Department, according to an announcement by Secretary Denby. A six-stage apparatus has been constructed which yields practically the same amplification over a range extending from a wave length of some hundred meters up to one in the vicinity of 20,000 meters.

## MUD RIM PREVENTS SKIDDING ON SLIPPERY ROADS

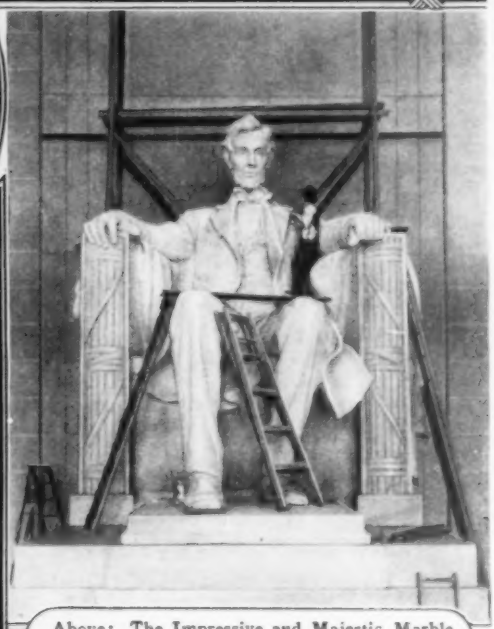
Slippery dirt roads, the bane of motorists, have been safeguarded against by the production of a metal mud rim, which is fastened to the tire in a manner somewhat similar to that used with the common chains. With this accessory, which can be attached in two minutes, the driver can travel safely over muddy roads, turn in and out of deep ruts at will, and always have the car under complete control, since skidding is practically impossible.



Metal Mud Rim Fitted to Automobile Tire for Prevention of Skidding on Muddy Roads: The Insert Shows How the Rim is Attached to the Tire

## STATELY LINCOLN MEMORIAL DEDICATED

It seems particularly fitting that Memorial Day should have been chosen for the dedication of the Lincoln Memorial in Potomac Park, Washington. Plans and preparations have been going forward for more than 10 years, and the result is worthy of the time and patient effort expended, for the beautiful and impressive structure reflects in its simple strength the character of the man in whose honor it was erected. Standing as it does near the Potomac River, and harmonizing with its beautiful surroundings, the memorial is isolated from other buildings, but is yet easy of access for visitors. The structure is 156 ft. long by 84 ft. wide, and is situated on a terrace, so that its height is 122 ft. above the roadway grade. The central chamber contains only the heroic statue of the immortal Lincoln, seated, facing toward the capitol. The side rooms, separated from the main chamber by columns, contain large tablets on which appear the texts of his Gettysburg and second-inaugural speeches, while mural paintings, 12 by 60 ft., show in allegory the subjects "Emancipation" and "Reunion."



Above: The Impressive and Majestic Marble Structure Erected as the Nation's Memorial to Abraham Lincoln. The Building, with a Frontage of 156 and a Depth of 84 Feet, is Raised on a Terrace So That Its Height Is 122 Feet above the Roadway Grade. Thirty-Eight Columns, 46 Feet Long and Weighing Approximately 192 Tons Each, Support the Cornice, on Which Appear the Names of All the States. Besides the Statue of Lincoln, Inside, There Are Tablets on Which are Carved the Texts of His Gettysburg Speech and Second Inaugural. Below: Two Views of the Noble Statue of the Immortal Lincoln, Seated, Facing the Capitol. The Statue Is 20 Feet High from the Feet to the Top of the Head

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## BALLET DANCER PERFORMS ON TYPEWRITER KEYS

Operating the keys of a typewriter with her toes is the accomplishment of a talented ballet dancer now appearing on one of the vaudeville circuits in this country. Balancing with one toe on the roller carriage of the machine, the performer gracefully sways and gestures in perfect time with the music. With the other toe, as she bends low in rhythm with the melody, she lightly and accurately taps certain keys and the space bar. At the conclusion of her entertainment, amidst the customary admiring applause, the dancer usually tosses the neatly written note which reads, "I thank you," to some person in the audience as a souvenir.

Left: Ballet Dancer Balancing with One Toe on Roller Carriage of Typewriter, with the Other Free to Tap the Keys. Right: Beginning the Dance

## CAT-TAIL GROWTHS PROVED BENEFICIAL FOR HOGS

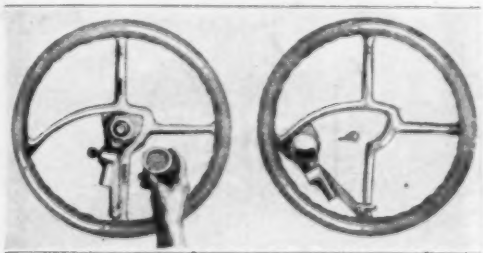
Hogs, to the number of 60 head, were recently turned into a three-acre cat-tail swamp by a New Mexico farmer as an experiment to determine the practical value of this growth as a food for these animals. At the end of three months when the hogs were examined, it was found that all had received sufficient nutriment to keep them in good flesh, and none was discovered to be suffering from any illness or digestive disturbance.

## POISONED IN ONE APARTMENT BY FUMES FROM ANOTHER

One morning, a short time ago, the bodies of a man and his wife, both over 70 years of age, were found lying on the bathroom floor of their apartment in a Brooklyn hotel. An autopsy proved that both had been poisoned, and yet there was no trace of any kind of poison within the apartment. There were no conditions existing that suggested the possibility of either suicide or murder. It was finally discovered that the rooms immediately below the apartment had been fumigated just before the death of the couple, and investigation showed that apertures for steam and water pipes extended upward into the fatal apartment. There was reason to believe that the fumigating drug was some form of prussic acid, and that the fumes had reached the bathroom above through these apertures, and thus poisoned the aged couple. Similar cases have occurred elsewhere.

## ADJUSTABLE LOCK AVAILABLE FOR STEERING WHEEL

Safeguarding an automobile against thieves is aided by the introduction of a combined steering wheel and lock of case-hardened steel. The accessory is easily installed, and said to be immune from being "picked," and as an added feature, it can be swung aside several inches, so that the driver has more space when getting in or out of the machine.



Left: Adjustable Steering Wheel Ready for Driving. Right: Wheel Swung Aside for Driver to Alight

Ferryboat to Be Ready for Service, This Summer, across the Hudson River, between Poughkeepsie and Highlands: There Is Neither Smokestack nor Engine Room above the Main Deck

## OIL-ELECTRIC FERRYBOAT ON THE HUDSON RIVER

Motorists crossing the Hudson River between Poughkeepsie and Highlands, N. Y., this summer, will find at their service a new ferryboat that will excel anything of the kind they have ever seen before. The vessel, now under construction, will be of exceptional capacity, and will be electrically propelled. The generators are to be driven by heavy-oil engines, and the whole power plant is to be installed in the hull beneath the main deck. Consequently, there will be no engine room or smokestack to interfere with this deck, which will be housed in, and have four uninterrupted driveways for automobiles, giving a car-carrying capacity about double that of a similar steam-driven vessel. The entire control of the motors will be in the pilot house, where the pilot will run the ferryboat much in the same way as a driver runs an electric street car. The control of the electric propelling system is so flexible that it will be possible to stop and reverse the vessel in a few seconds.

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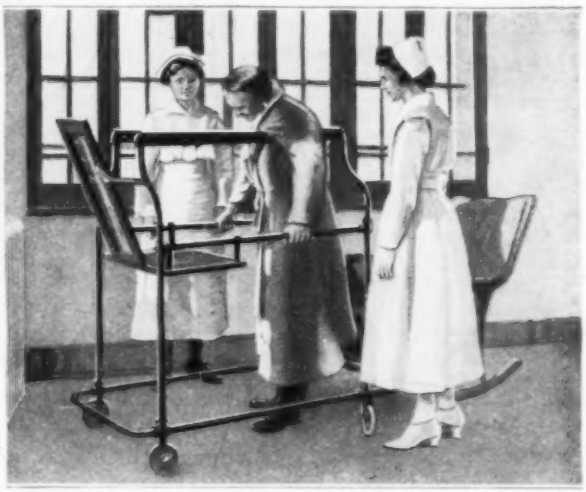
¶ Like horses, which were superseded by the automobile, the hurdy-gurdy is now being displaced by radio in New York City. A receiving set mounted on a motor truck is said to be attracting larger crowds than ever stopped to listen to the familiar old instrument.

## ROLLING CRUTCH WITH CHAIR FASTENED TO FRAMEWORK

Invalids and cripples have been benefited by the introduction of a rolling crutch which has a chair fastened to the framework. The contrivance is constructed of the lightest steel tubing, has ball-bearing, rubber-tired wheels, and is narrow enough to pass through the ordinary door. Thus the patient can be placed in the chair and wheeled to the spot chosen for exercise, after which the afflicted person again rests on the seat while the apparatus is taken back inside of the hospital, sanitarium, or home, with only a minimum of effort.



Rolling Crutch with a Chair Fastened to the Framework on Which the Patient Rests While being Wheeled to or from the Place Chosen for Exercise

## VOLTMETER OF HANDY DESIGN FOR BATTERY CHECKING

Rapid checking of batteries to ascertain their voltage is aided by the employment of a voltmeter of handy design, which is manufactured in Detroit. Instead of having two flexible wires, or leads, to connect with the battery, the new appliance possesses a pair of rigid studs, or contacts, and a convenient handle. The mechanic can thus quickly test the different cells, using only one hand, and writing down the readings with the other. A scale with its zero at the center eliminates the danger of reversing the instrument, as the indicating needle swings in either direction.

## DISK WHEELS OF STEEL MADE IN LIGHT WEIGHTS

Disk wheels of steel, heretofore found much too heavy for use on the common makes of light motor cars, are now being manufactured in weights that total but a few ounces more than the corresponding sizes in wood. Light-gauge metal is used in the construction of the wheels, which are radially corrugated and made either with or without hubs and are welded into standard felloes for taking either straight-side or clincher rims.

## NEW HYDROSTATIC APPARATUS TESTS CONCRETE PIPES

Hydrostatic tests on single lengths of concrete pipes are now being made, in California, without the use of false ends and tie-rods. The apparatus consists of two aluminum cylinders fitting one inside the other and each having flanged ends with a space between the flanges for a tubular gasket. These flanges fit tightly into the interior of the pipe under test, and water pressure is supplied to the gaskets and the space between the outer aluminum cylinder and the interior of the pipe. Up to the present 150 lb. per square inch is the safe limit for the apparatus. Improvements will raise this limit considerably.

## MOTOR-DRIVEN SCALING TOOL CLEANS METAL SURFACES

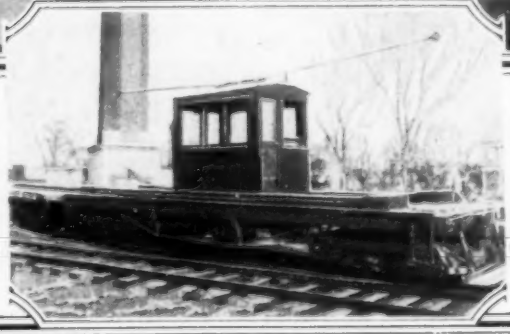
An electrically driven scaling tool for effectively removing rust and scale from metal surfaces, now in use in England, is in the form of a handle large enough to be grasped by both hands, with a head at one end in which a revolving scraper is driven by a flexible shaft coupled to it at the other end. The tool is used for cleaning boilers, for scaling ships' bottoms, and for other work of the same nature.

## WORK ON NEW NEBRASKA STATE CAPITOL BEGUN

Work has been started at Lincoln, Neb., on the new state capitol, which is to be one of the most remarkable buildings of the kind in the country. Its dominating feature will be a tower, soaring 400 ft. into the air, of substantial proportions and capped with a graceful dome. Around this tower the building is disposed in the form of a square, flanked by terraces, each side being 437 ft. long. This part of the building will be only two stories high, with an entrance building considerably higher that is fronted by a flight of stairs of ample width leading from the terrace to the street level. To expedite construction, a railway is being built through the city to the capitol grounds, so that no transshipment of the building material will be needed. An electric motor car will haul the freight cars on this railway. The new capitol will cost $5,000,000, and will take five years to build.

Above: Perspective View of the New Nebraska State Capitol, Now under Construction at Lincoln, Which It will Take Five Years to Complete. The Dome-Capped Tower in the Center of the Quadrangular Building Is 400 Feet High. Each Side of the Building Is 437 Feet Long. Below: Electric Motor Car That Hauls from Three to Five Freight Cars on the Railroad That has been Specially Built to Facilitate Transportation of Materials

Above: Old State Capitol, in Another Part of Capitol Square, Which will Not be Torn Down Until the New Building is Completed. Around the Square Is a Railroad Track Specially Built to Connect with the Track to the Main Railroads



Above: Looking down H Street, Where the Track is being Laid to Connect with the One around Capitol Square. The Property Owners Objected Strenuously to the Prospect of Having Freight Cars Rumbling past Their Windows, but without Effect

## NOVEL METHOD OF CAPTURING ESCAPED BLACK BEAR

A big black bear in one of the parks of Portland, Ore., escaped from his cage recently and caused considerable excitement in that portion of the city. He finally climbed high up in a fir tree, and all efforts to induce him to descend failed. At last a cage was built around the foot of the tree, and after a day of waiting, the bear changed his mind about remaining in the air and slid down the tree into the cage. Park attendants waited patiently until the bear was in the cage, when it was a simple matter to return him to his place in the park.

**After Spending a Day in the Top of This Tree, the Escaped Black Bear Slid Down into the Cage**

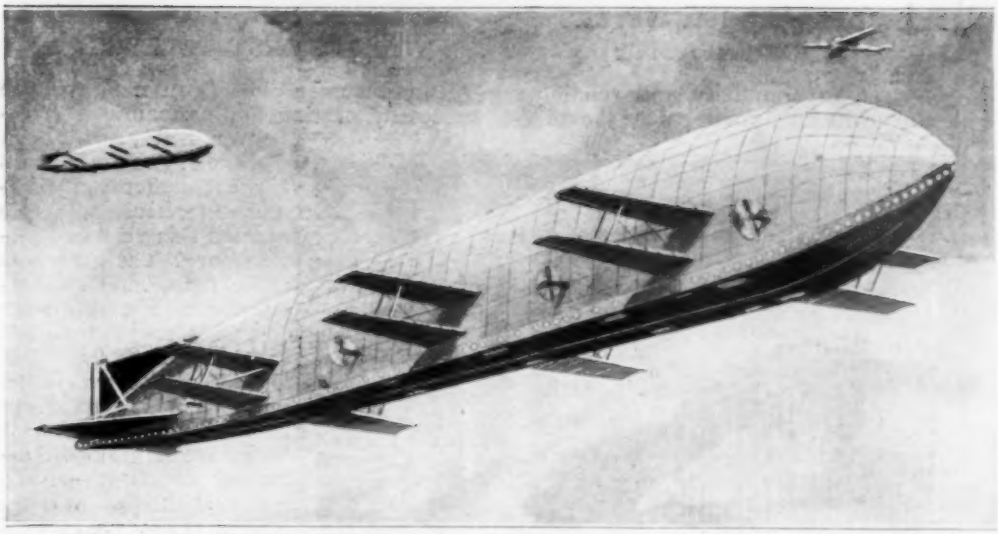
## "AGE-HARDENING" MAKES ALLOYS VALUABLE

Important and very interesting facts have recently been announced respecting the "age-hardening" of certain light alloys of aluminum, of which the well-known duralumin is one. These alloys have enjoyed increasing use and value in the arts and industries on account of the combination of lightness and strength which is found in them. Unlike most nonferrous alloys, the alloys of aluminum can be heat-treated like steel, to the great improvement of their physical properties. After undergoing this process, these alloys have the curious property of being soft immediately after quenching at a temperature of 500°C. (932°F.), but the hardness increases with time, and the maximum hardness and strength is practically reached in two or three days. This phenomenon of increasing hardness with time is known as age-hardening.

According to an announcement just made, it appears that this age-hardening is produced by silicon, which previously has been regarded more or less as an impurity. It is now found that, when the alloys are quenched, a compound of magnesium and silicon is retained in an unstable condition, which in a few days changes to a more stable form, believed to consist of particles of magnesium silicide highly dispersed throughout the aluminum. These particles are so fine that they cannot be seen under the highest-power microscope available, but they give to the alloys their valuable characteristic of increasing in hardness and strength after quenching to a point where they are valuable for many structural purposes. It has been determined that the hardness reached depends upon the amount of magnesium silicide present, up to a certain point, beyond which further amounts of this compound will not give increased age-hardening. New alloys have also been produced, some of which may be of practical value.

## MAKE BROOM HANDLE TUBULAR INSTEAD OF SOLID STICK

In an effort to improve that standard household utensil, the common broom, an inventor, using a patented machine, has succeeded in making a tubular wooden handle which is much lighter than the solid stick and yet is strong and straight. The tube is made of veneer joined with waterproof glue, and is 1⅛ in. in diameter, with walls ⅛ in. thick.



This Passenger and Freight-Carrying Airship has been Designed for Use with the Newly Discovered, Noninflammable Gas in Connection with "Vertical Lift" Devices Placed in Each Pair of Side Wings

## NEW DESIGN OF AIRSHIP WILL USE NONEXPLOSIVE GAS

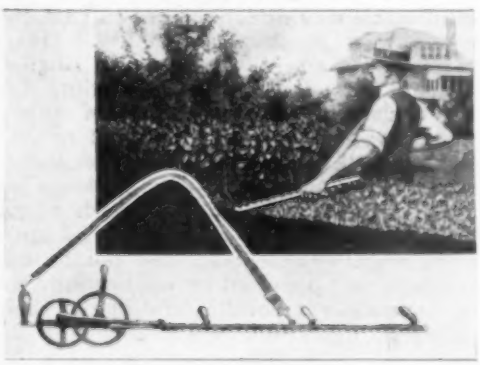
As was to be expected, the discovery of a new nonexplosive, noninflammable gas for airships—mention of which was made in the June issue of this magazine—has led to the formulation of plans for the construction of a number of airship carriers for freight and passenger service. In design, the ships will differ from other forms of air craft, as they will be supplied with a central rigid frame and will have wings at the sides. The number of wings, motors, and propellers will depend on the size of the ship. In each pair of wings will be inserted a "vertical lift" device, claimed to be much more efficient than the ordinary propeller, and making it possible for the airship to rise and descend vertically. The noninflammable character of the gas used for lifting makes possible many improvements in design and construction. The new gas has a lifting power almost equal to hydrogen and is said to be cheaper than helium.

## MOLYBDENITE FOUND TO GIVE "PHOTONEGATIVE" REACTION

Some substances, like selenium, when exposed to the light, decrease in electrical resistance, but it has been found that samples of molybdenite connected with a battery and exposed to green, blue, or yellow light, show higher resistance than when kept in the dark. This is called a "photonegative" reaction. Tests have been performed on samples of molybdenite in an effort to determine if the action is reversible, and it has been found that a small electric current is generated when the samples are exposed to light.

## HEDGE-TRIMMING MACHINE OPERATED BY ANYONE

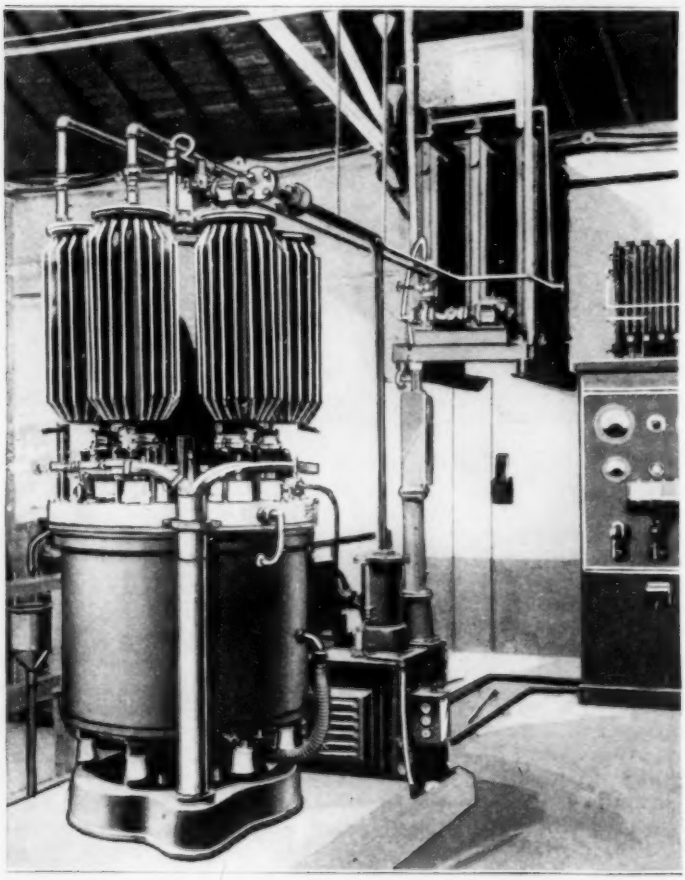
Trimming hedges, usually a tedious task and one requiring considerable skill, has been simplified by the introduction of a machine for this purpose. This innovation, weighing but 15 lb., is suspended from the shoulders by a strap, the operator steadying the apparatus with one hand and with the other turning a crank which is geared to the high-grade steel cutting bar. The outfit is manufactured in two sizes, one making a 40-in. and the other a 60-in. cut.



Above: Hedge-Trimming Machine as Used When Cutting the Top. Below: Close-Up of Machine

## MERCURY-ARC RECTIFIERS OF LARGE CAPACITY

Compared in simplicity and reliability with the ordinary transformer, the mercury-arc rectifier has been improved upon until stationary direct-current substations are now a practical possibility. Overcoming serious difficulties, an English concern has developed the rectifier for the satisfactory performance of heavy power work. Units with ratings of 300, 600, and 1,000 amperes, have been standardized for manufacturing purposes at any voltage up to 750, and, with slight modifications, will successfully handle 1,500 volts. These machines can be advantageously operated by connecting two or more units in parallel, and due to their noiseless operation, will no doubt be acceptable in various localities where the sound of the familiar rotary converters would be objectionable.



**Mercury-Arc Rectifier Which has Recently been Installed in Paris, France, Showing the Piping of the Water-Cooling Apparatus and Also the Necessary Switch Gear and Controlling Panel Board**

## REFLECTOR CAST IN AMERICA FOR LARGEST TELESCOPE

Announcement has been made of the successful casting and annealing at Vancouver, B. C., of a 10-ton disk for the world's largest reflecting telescope which will be erected this year at Seattle, Wash. The glass was made from sand imported from five different countries, and is reported to have cost $360,000. It is the largest ever cast, and when it has been ground and silvered, it will have a practical diameter of 10 ft.—19 in. more than the present largest telescope, located at Mount Wilson, California.

The Mount Wilson disk was cast at the St. Gobain works in France. The war hindered the work considerably, and more than three years were required to produce the great block of flawless glass needed. It was said no American glass works would take the contract for the Seattle mirror, and those in Europe were ruined by the war. Finally an astronomer and student of glass processes attached to the Dominion meteorological service accepted the contract to produce the glass in one year.

The huge new reflector was shipped to Seattle on an especially constructed barge and so packed with mattresses and springs that it could not suffer damage. The site for the observatory has not yet been chosen, but it will be in or near Seattle. The project is being built by a local capitalist, and when completed will be known as the Frye Observatory. This will give the Pacific coast the three largest astronomical telescopes in the world, including the Mount Wilson instrument and the Dominion government 72-in. reflector located at Sanich, British Columbia.

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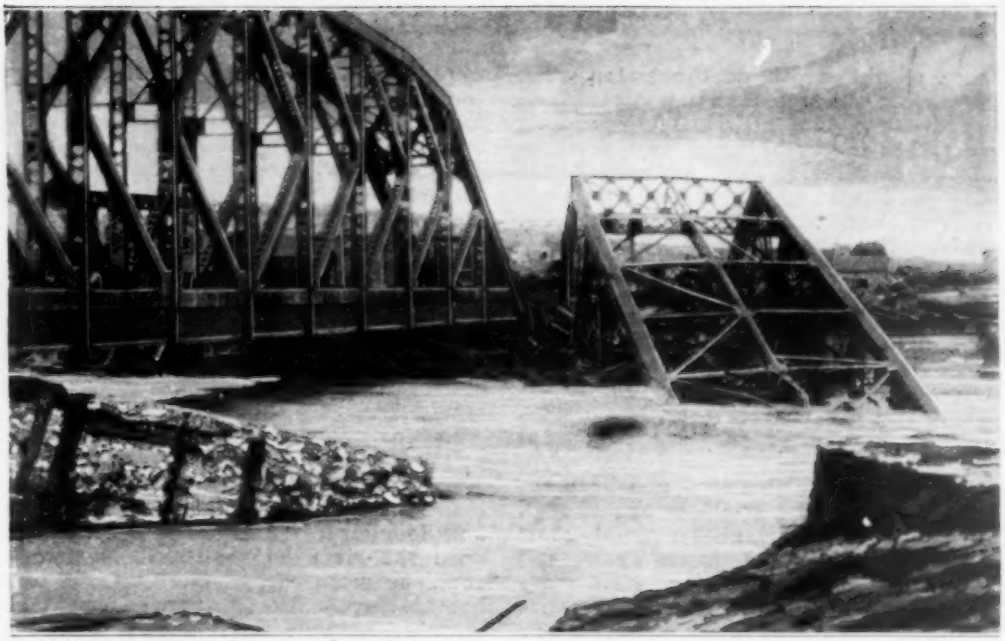
¶About 170 vessels are to be built in Belgium for transporting coal from the Ruhr district on the river Rhine.



**Wreckage of the Denver and Rio Grande Western Bridge at Pueblo, Colorado, the Result of a Flood in the Arkansas River: About 25 Feet Away from the Wrecked Bridge Another, Seen Standing, Carries the Traffic of Four Railroad Lines In and Out of Pueblo**

# BRIDGE "BOOSTING"—A NEW JOB FOR DYNAMITE

By H. S. ARBO

MANY a time when Nature and man come to grips, all-powerful Nature defies the best efforts of man to overcome her. But in most instances man with ingenious application of his modern resources is the victor. This was the case when Nature and the Arkansas River refused to succumb to ordinary salvage methods, and seemed determined to hold the Pueblo bridge which the swollen, raging torrent had buried deep in the sand and débris at the river bottom.

At the time of the flood last year, the rushing Arkansas River undermined the piles of the bridge of the Denver and Rio Grande Western Railroad, at Pueblo. The piling gone, the great bridge sank deep into the sand and settled there. Then followed a period when the swift current, carrying a quantity of débris, consisting of logs, lumber, mud, and all kinds of drift, piled it high over the fallen structure, imbedding it deeper in the sands and threatening to cause serious damage by damming up the river channel.

Most of the superstructure of the bridge was cut off with oxyacetylene torches and carried to the bank by cranes. The surface driftwood was cleared away by hand. The trouble came when the salvage engineers were confronted with the problem of removing the heavy girders and uprights which were imbedded deep in the sand, and of getting rid of the débris which had been thrown over the structure by the current.

This was not a simple task. The first method attempted was to blast out the débris and at the same time to loosen the sand around the bridge and partly raise it by firing off several charges of high explosive simultaneously under the buried deck of the bridge. It was necessary to place the explosive under the bridge deck, for if it were placed above that point, it would only throw the water about without doing any work of value on the bridge itself. Furthermore, as the bridge was within 25 ft. of a standing steel bridge over which all the traffic of four railroad lines passes in and out of Pueblo, extreme care in placing and firing these charges was necessary. So, in order to place the charges in the desired position, 4-in. pipes, pointed at one end, were driven into the river bed under the bridge deck. Eighty-per-cent gelatin dynamite was then loaded into these pipes, and the contents of all the pipes fired simultaneously with electric blasting caps. Be-

cause of the depth of the water, very little of the blasted material was thrown any distance, and no damage was done except for the breaking of two or three telephone wires. Two multiple blasts were fired, getting rid of the débris effectively and somewhat loosening the sand holding the bridge.

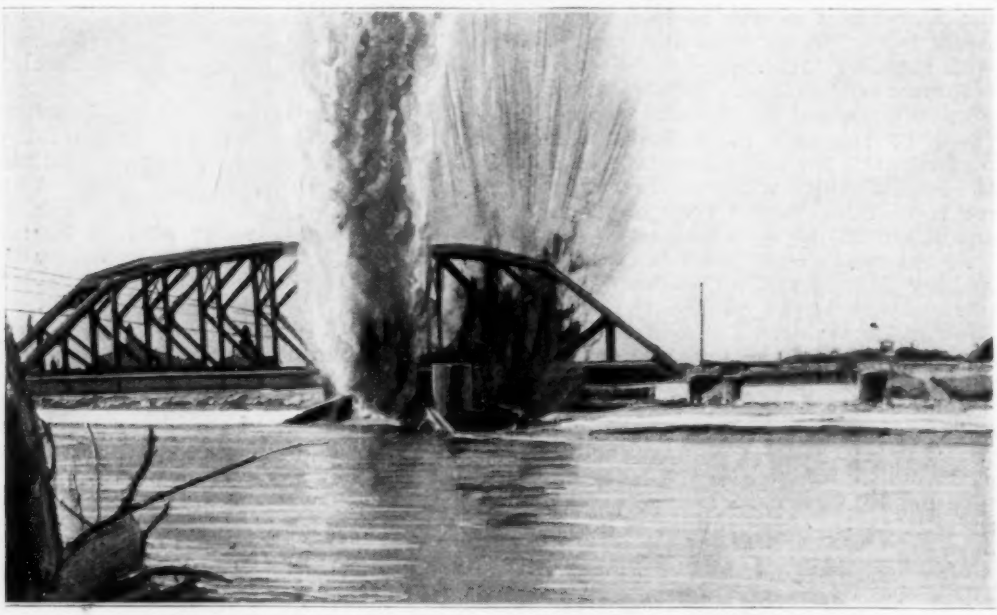
But even after the blasts the bridge was so firmly anchored that it was impossible to get chains and tackle strong enough to pull it out. Two steam cranes and two hoists, exerting a joint pull of over 300 tons, easily snapped the 1½-in. cables and the chains with links 1½ in. thick, even though they were doubled and quadrupled.

While the wrecking crew was busy endeavoring to find a chain strong enough to lift the bridge, another flood came along, piled on more débris again, and shifted the bridge into an even more difficult position in the sand. To raise the bridge even after it was loosened now seemed impossible.

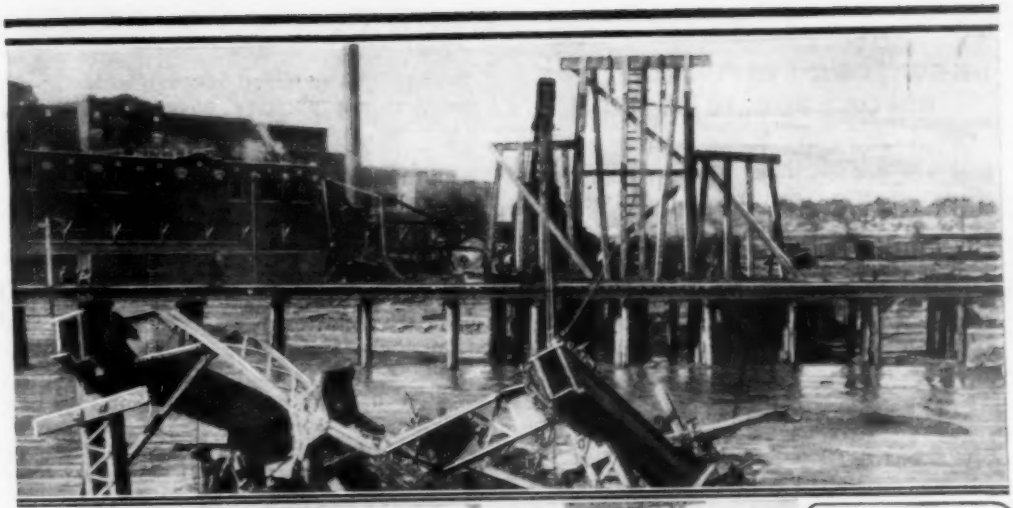
The ingenuity of man was not exhausted, however. It was decided that the part of the bridge under water but above the river bed should be blasted into sections and carried to the bank piecemeal. The swift current of the river made difficult the accurate placing of the explosive around the bridge members. So pipes were resorted to again. These were driven down into the river, to be cut off and fired simultaneously as before. As the bed was now too solid and hard to drive the pipes by hand, a special pile driver was improvised. A 15-ft. guide was erected on a raft anchored by ropes. The weight was placed in this guide and attached to a rope running over a pulley at the top of the guide. The weight was raised and lowered by six men pulling on the rope and then suddenly letting go. When the pipes were in position they were loaded with charges of from 200 to 400 lb. of dynamite and then fired simultaneously.

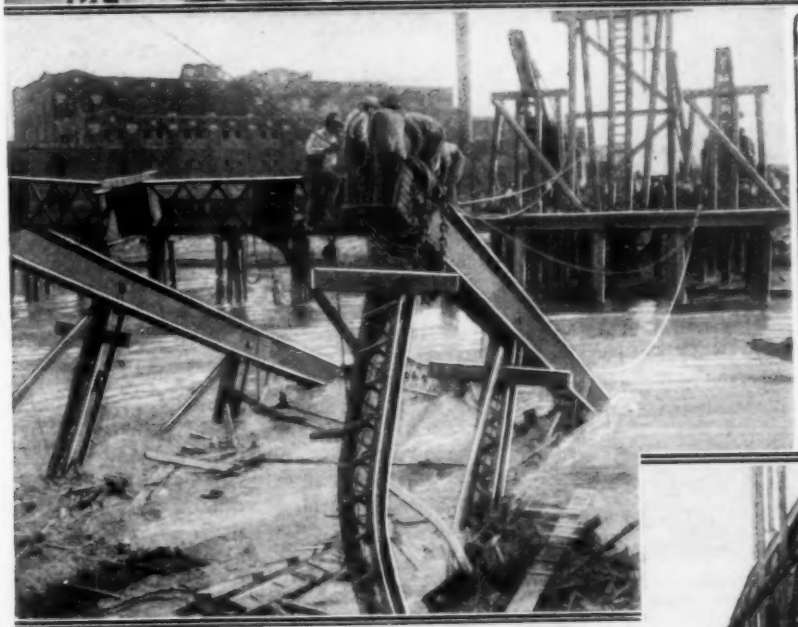
In this manner, all the superstructure of the bridge above the river bottom was eventually cut to pieces and taken to the banks by cranes and hoists. The deck and floor structure of the bridge was left until the river had subsided so that it could be more easily taken out. It was not absolutely necessary to remove this, however, because the superstructure constituted the real menace, as it caught the drift and was likely to dam up the river channel.

For the whole work 1,200 lb. of dynamite, costing $360, was used, thereby saving the railroad several thousands of dollars which would have been spent had the bridge been removed by mechanical means—if it could have been done at all in that way.

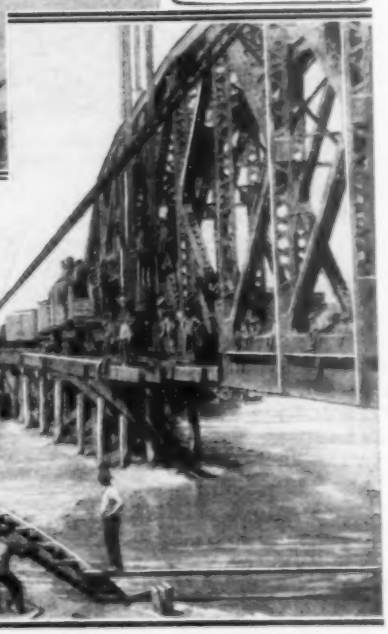


**In Order to Break Up the Wrecked Bridge, a Number of Four-Inch Pipes, Pointed at One End and Loaded with Dynamite, were Driven into the River Bed under the Bridge Deck. Here is Seen the Result of the Firing of One Group of These Pipes**





Above: Result of a Second Flood That Left the Wrecked Bridge in a Still Worse Condition than That Caused by the Previous Flood. Left: Parts of the Bridge That Remained above the Water being Cut Off with Oxyacetylene Torches and Then Hauled Ashore by Cranes. This Was the Easiest Part of the Work in Connection with the Removal of the Wreckage



Right: Cables from the Cranes and Hoists Attached to the Neighboring Bridge That Remained Standing. Two Steam Cranes and Two Hoists Exerted a Combined Pull of Over 300 Tons. To the Left are Seen Men Loading Dynamite into Pipes That have been Driven by the Pile Driver. Electric Blasting Caps were Then Connected to the Pipes

## NEW YORK STATUE ON TRIAL BEFORE PUBLIC OPINION

A piece of statuary in New York City, that has caused more comment and controversy than the 18th amendment, is

Marble Statue Named "Civic Virtue" in City Hall Park, New York, Which has been Much Criticised

called "Civic Virtue," and stands on guard at the new fountain pool in City Hall Park, over which the 57-story Woolworth Building casts its afternoon shadow. "Civic Virtue" is by MacMonnies, the noted sculptor who has been so successful with his statues of Lincoln and other famous men, but this latest work has received no end of both criticism and commendation since its recent installation. It represents the triumph of Virtue over Vice. Because the leading figure is a man trampling underfoot female figures representing evil sirens, the statuary has received especially severe criticism from many of the women of the city. Before being brought from the sculptor's workshop, "Civic Virtue" was given a thick coat of plaster to protect it from possible damage. It required several hours to remove this protective covering after the work had been set on its pedestal. While the statue has been accepted by the city-park authorities, the public still continues its criticism and favorable comment, many of the remarks being rather humorous. "It ain't art to have a guy stepping on a girl's neck that way," said a youthful onlooker. "Huh, those women represent vice—the man doesn't. That's why the women are kicking about it," replied his companion. "If that fellow only had a baseball bat in his hand we would all like him," remarked another. Even visitors to the city are joining heartily in the big jury that is trying to decide whether "Civic Virtue" is a good or bad piece of workmanship.

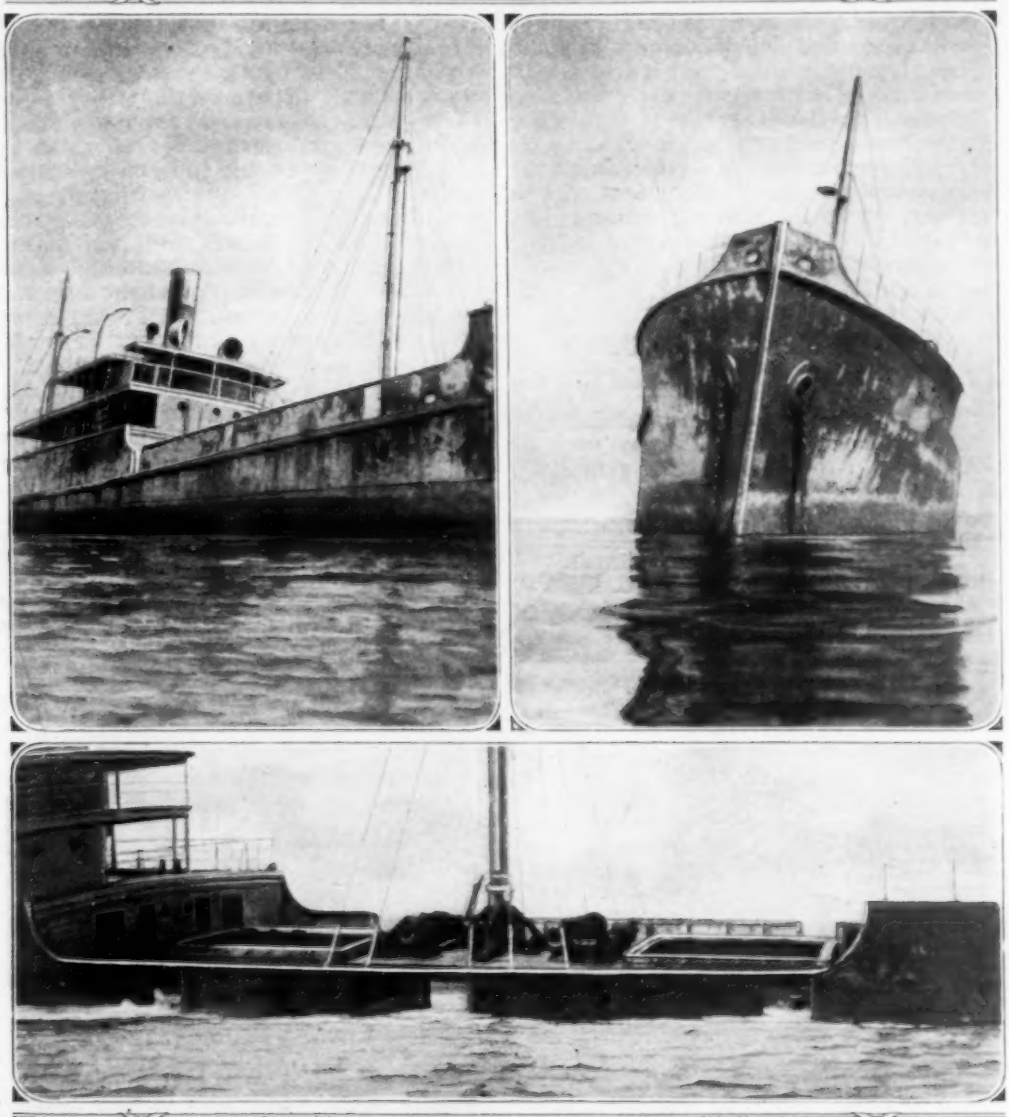
## UNSIGHTLY TRIMMED TREES ON LINCOLN HIGHWAY

Trees are usually considered obstacles by the telephone and telegraph companies, who invariably sacrifice the beauty of any such growth to add to the efficiency of their lines. A graphic instance of this can be seen on the Lincoln Highway near Thomasville, Pa., where characteristic mutilations have been effected. Evergreen trees, growing so as to interfere with the free stringing of telegraph wires, have had great "bites" taken from their graceful contour. These now present a curious sight to passing motorists, who doubtless must wonder why commercial ways are thus permitted to spoil the beauties of nature.

Tree on Lincoln Highway, Showing the Unsightly "Bite" Taken from Its Contour to Permit the Free Stringing of Telegraph Wires

# WRECK OF CONCRETE SHIP SHOWS GREAT ENDURANCE

AT night, in February, 1920, during a blinding blizzard and amid great cakes of floating ice, the steamer "Polias," without cargo, mistook floating beacons and struck on a submerged ledge off Port Clyde, Me. The ship, which was 250 ft. long, did not differ from a type largely constructed during the war, except that the hull was of concrete. Eleven of the crew who left in small boats were drowned, while those who remained aboard found their trust in the ship vindicated. The ship lies broadside to the sea, exposed to heavy waves and swells at all times, for the tides, which rise 13 ft. at this point, surge over the hidden ledges with tremendous force even in calm weather. An inspection of the ship in July, 1920, revealed no damage whatever, except a hole in the bottom and water in the hold. Otherwise the hull, decks, and bulwarks, all of concrete, did



Three Views of the Concrete Ship "Polias," Grounded on a Submerged Reef off the Coast of Maine: Lying Broadside to the Open Sea and Exposed to the Pounding Waves and Tides, the Ship Shows Few Signs of Going to Pieces, Even after 28 Months of Severe Buffeting

not show even a small crack. Standing on the main deck, or bridge, one no more felt the pounding seas than on land.

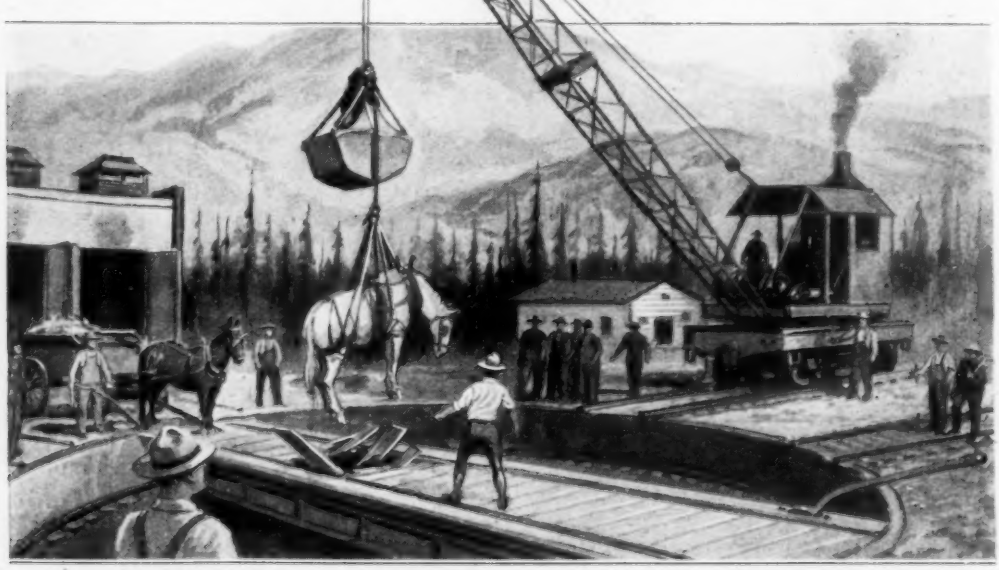
Efforts to raise the ship, which cost upward of $2,000,000, proved unsuccessful, however, and a second visit in August, 1921, disclosed little change in its condition. Some of the upper works, which were built of wood, had begun to wash away, and the paint was gone in spots, from the sides; otherwise it appeared as solid as the rock on which it rested. The chief of the salvage crew stated that a steel or wooden vessel in the same position could not have endured the seas three months. The accident was in no way due to the concrete construction. According to latest advices, the hulk is still safe and sound, after defying the elements for 28 months.

## CLAMSHELL CRANE USED TO SAVE HORSE'S LIFE

The roundhouse on the first division of the Canadian National Railway west of Edmonton, is built right over a muskeg. A short while ago it was found necessary to make a five-stall extension to it, and in excavating for the laying of the concrete a great deal of trash, such as old roots, etc., was dug up. A homesteader was engaged by the contractor to haul this stuff. To get to the place where he was allowed to dump the stuff, the homesteader was obliged to cross a number of tracks, so, in order to save time, he used the locomotive turntable whenever it was idle.

This worked nicely for a while, and then on one trip, as he was returning, one of his horses broke through the planking on the turntable and its hind leg caught between two beams. In less time than it takes to tell it, half a hundred men were on the scene. The only thing they could do, however, was to hold the horse down, as it would surely have broken a leg by struggling. For some time no one could think of a feasible way of getting the animal out, and then the clamshell engineer appeared on the scene. Without saying much, he turned back to his outfit where he was digging ashes out of the pits and loading onto cars, and ran the crane up to the edge of the turntable pit. By making a sling of ropes around the horse and attaching the crane hook, the quick-witted engineer was able to hoist the animal carefully so that others could get its leg free, after which he swung it clear of the turntable to the ground.

¶A stone-cutting circular saw, of unusual proportions, is 100½ in. in diameter, ⅜ in. thick, and weighs nearly 900 lb. Around its periphery are 210 diamonds, and at a speed of about 600 r.p.m. it cuts through a 6 by 3-ft. stone slab in 15 minutes.



**Clamshell Crane Shown in the Act of Hoisting the Horse from the Large Hole Seen in the Planking, Preparatory to Swinging the Unusual Load Clear of the Turntable to the Ground, Thus Avoiding the Necessity of Shooting the Imprisoned and Struggling Animal**

# NEW TRANSATLANTIC RECEIVING AERIAL STRUNG ON TELEGRAPH POLES

By BERNARD G. PRIESTLEY

ORDINARY telegraph poles support an antenna stretching cross-country for eight miles, that is now being used for the reception of transatlantic wireless messages from England, France, Germany, and Norway, at the receiving station of the Radio Corporation of America at Chatham, Cape Cod, Mass. Running less than 30 ft. from the ground, this antenna is a decided departure from the old type strung between towering pylons commonly used for intercepting wireless messages coming from long distances. The new aerial replaces one consisting of several wires, strung between an iron mast 320 ft. high and steel towers more than 100 ft. high. In one respect particularly is the new antenna an advancement over the old. The wires can be used for receiving an unlimited number of messages at the same time, provided a separate receiving set is employed for each message. Fifteen messages have been received simultaneously on this type of aerial without interference. Four receiving sets at the station are constantly taking messages over this single antenna today. The results have led to discontinuance of high aerials at the station.

At the Right is Seen One of the Telegraph Poles That Carry the Eight-Mile Receiving Antenna. The Upper and Lower Wires on Each Side are Joined near the Station

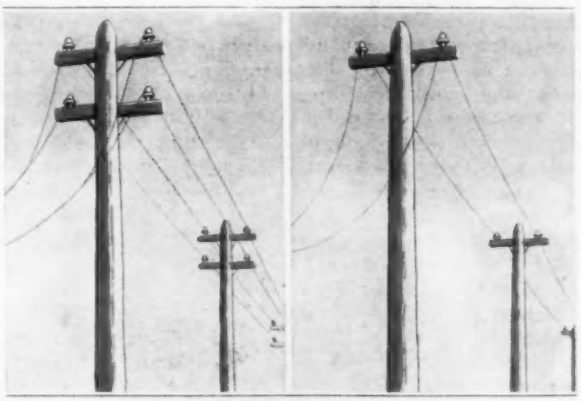
The lower cost of construction and maintenance of the new antenna as compared with the old gives the former a decided advantage over the latter. The new type has demonstrated its superiority over the old in three important respects, in addition to its ability to pick up an unlimited number of messages at the same time: First, its arrangement enables it to eliminate interference by messages not intended for the station; second, the wires are so arranged as to give double signal strength, making relatively easy the task of catching messages that, under very unfavorable atmospheric conditions, it would be most difficult if not impossible to receive with the old type; and third, the antenna is so low that it reduces to a minimum the heavy charges of static which are picked up and magnified on high aerials.

The eight-mile antenna, stretching from Chatham to South Dennis, goes through woods much of the distance. A clearing, about 30 ft. wide, has been made through the woods. The aerial points toward the land transmitting stations in Europe from which messages are most commonly received at the Chatham station. The wires are strung on glass insulators on the arms of the telegraph poles in precisely the same way that telephone and telegraph lines are put up. There are two arms on each pole, and a wire running on either side of each arm. The wires are paired and joined outside the receiving station, those on the same side of the pole forming a pair. Thus, two wires instead of four run into the receiving sets inside the building.

Four Tiers of Receiving Sets in the Station can Receive Messages from the Telegraph-Pole Antenna at the Same Time without Interfering with Each Other

The paired wires act in the same way as would a single wire except that they double the signal strength of the incoming messages. The arrangement of the wires — in two sets of two wires running opposite and parallel with each other—practically prevents interfering wireless waves from

crossing the wires from either side. Special devices at the end of the aerial near the station deflect interference from that end, so that only messages coming from the east, or ocean end, of the antenna have free access to it. The long aerial really picks up the messages and transmits them over the wires to the receiving units. With the receiving sets tuned for various wave lengths and stations, they are able to take the messages from the wires without the slightest interference with each other.



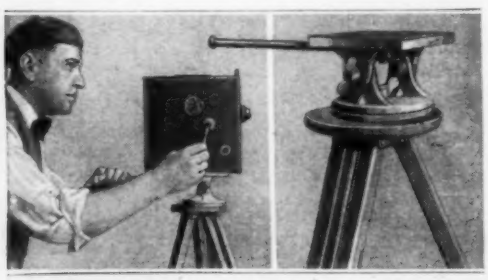
Left: At the Station End of the Eight-Mile Transatlantic Antenna the Two Wires on Each Side of the Pole are Connected, Giving Double Signal Strength. Right: The Station End of the Shorter Aerial, 1⅛ Miles Long, Used for Receiving Messages from Ships

A second aerial of the new type has been put into use at the station for receiving messages from ships at sea. But this is only 1⅛ miles long, and it is intended for work of a much shorter range than the longer antenna. The marine aerial has one set of opposite and parallel wires, one wire strung along on each side of the single arm on each telegraph pole.

Messages received at the station are, immediately upon their receipt, transmitted over private telegraph wires to Boston and thence to the headquarters of the radio company in New York City. Messages to be transmitted come back over the same route, but pass through Chatham station and on to Marion, Mass., 50 miles farther, before they are transmitted. Transmission is controlled from New York, more than 400 miles distant from the transmitting aerials.

## TILTING TRIPOD HEAD AIDS MOTION-PICTURE MAN

Taking motion pictures at unusual angles is possible with a tripod head which can be tilted up or down with one hand, leaving the other free to turn the crank. The appliance possesses a long tillerlike handle for operation, is made of aluminum, and is adaptable to any standard tripod. The tilting does not interfere with the cranking mechanism, and this outfit is said to be particularly adapted for those not skilled in this form of photography.



The Operator can Tilt the Tripod Head with the Long Lever and Crank the Camera at the Same Time. Right: Close View Showing Construction

## OLD WATCH OF CURIOUS MAKE WON WORLD'S-FAIR MEDAL

Dating back more than half a century to the world's fair at Paris in 1867, where it was awarded a gold medal, is the record of a hand-made watch produced by a jeweler of Copenhagen, Denmark. The strange timepiece possesses a dial divided into the so-called "universal," or decimal, time of 10 hours, 100 minutes, and 100 seconds.

A Watch Which Keeps Time on the Decimal System, in Which There Are 100 Seconds to the Minute, 100 Minutes to the Hour, and 10 Hours to the Day

# CHICAGO'S PROGRAM OF CIVIC IMPROVEMENT

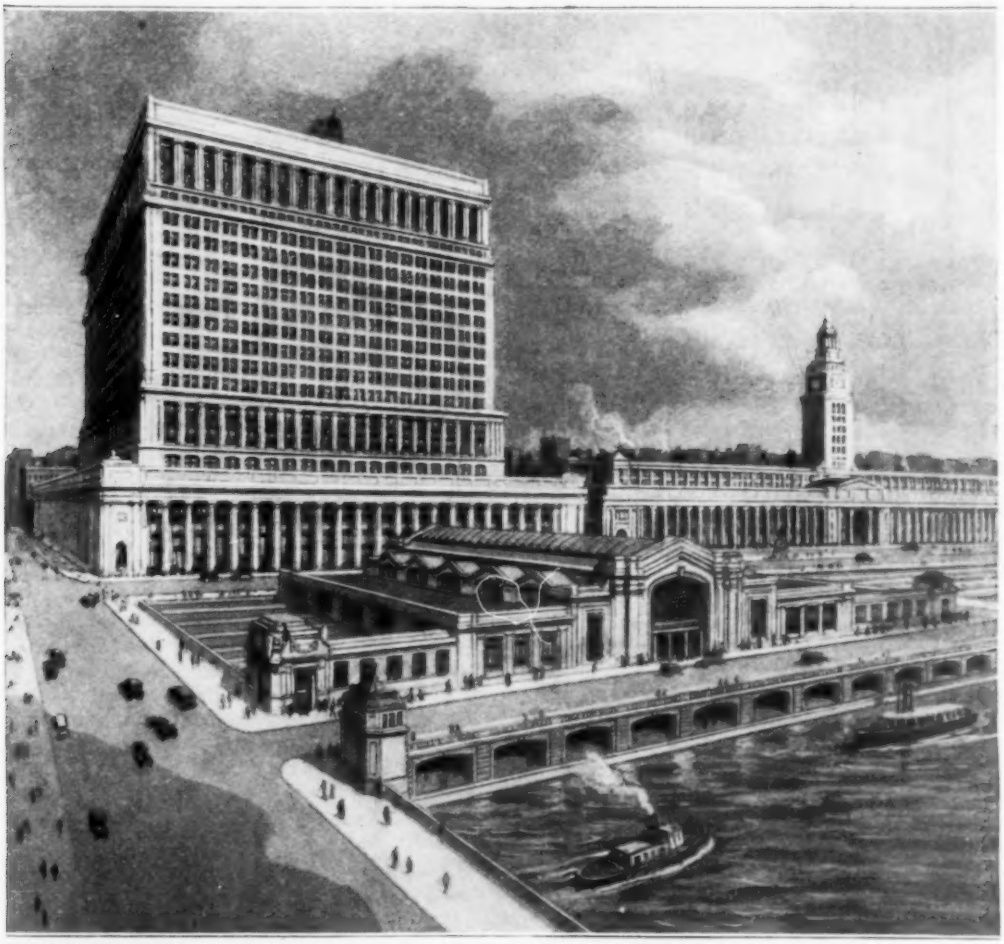
By CLEVELAND GAINES

**Construction Progressing on the New Union Station; Plans for a New Central Station, and an Improvement of the River Front and Modernizing of South Water Street**

FOR many years, a group of far-sighted Chicago men have been striving for an ideal in city planning, and developments have now progressed to a point where it seems possible that their dreams may be realized. Three great projects within the city are either under construction, or have reached a point where work will soon be started.

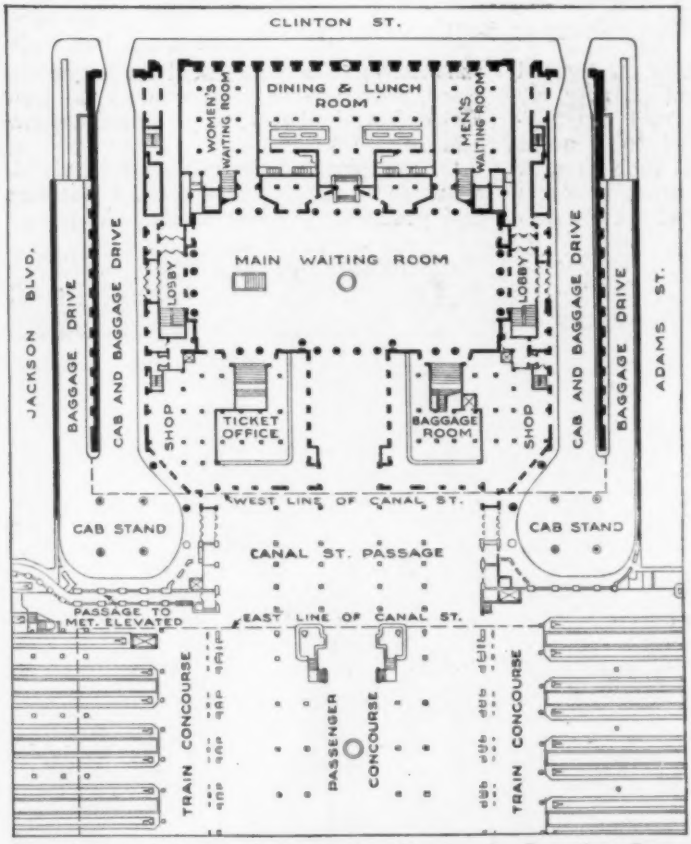
In any city, the visitors' first impressions are gained from the terminal facilities, so it is only proper that these should have first consideration in any plans for civic betterment. In all the work of the Chicago Plan Commission the question of railroad terminals has held an important place, with special reference to the new Union Terminal and the proposed Central Station.

Of the former, there will soon be visible evidence of the years of careful planning and preliminary construction. Work on various parts of the project, including extensive street alterations and viaduct approaches to the river bridges, has been in progress for several years, but the station proper is yet to be built. When completed, this station will occupy an entire city block and will be surmounted by a 20-story office building. The station itself



**The New Union Station as It will Appear When Completed: The Train Concourse is Located under the Building in the Foreground; the Office Building at the Rear will House the Station Proper, Connected with the Concourse by a Passage. The Proposed United States Post Office and Federal Building Appears at the Right**

is of the twin, or double-end, design, with a transverse concourse between two sets of stub tracks. Railways will enter from the north and south, respectively, with common facilities for handling passengers and baggage. The tracks have been depressed to about 4 ft. above water level in the river, and the streets have been raised and widened to provide adequate approaches. There will be 14 tracks in the south trainshed and 10 in the north, all arranged singly and separated by platforms. Alternate platforms will be assigned for handling baggage coming from the baggage room under the concourse.



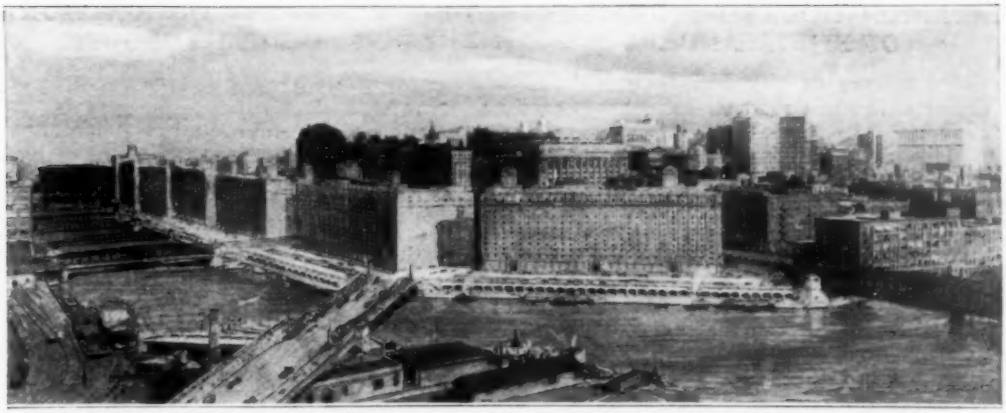

Ground Plan of the New Union Station, Showing the Convenient Grouping of the Ticket Office, Baggage Room, and Waiting Room: A Passage under Canal Street Connects the Station with the Train Concourse, the Full Width of Which is Not Shown

The station facilities, such as waiting room, ticket office, lunch room, etc., will be located under the main building, and will be connected with the train concourse by passages under the street. For the use of cabs and baggage wagons, inclined ramps at the sides of the building will lead from the street to the track level. The exterior of the station, office-building, and concourse entrances will be of buff stone.

The plans for the Central Station have not as yet progressed as far as the Union Terminal, but are fast approaching a point where action will result. This station will be located near the lake front,

BY COURTESY OF THE CHICAGO PLAN COMMISSION

A Bird's-Eye View, Looking South, of the Central-Station Project as It will Appear When Completed: The New Field Museum Appears at the Left, and behind It the Proposed Athletic Stadium. The Central Station, at the Right, is Located Just South of Roosevelt Road and East of Michigan Avenue, at the Extreme Right. The Illinois Central Right of Way is Seen Extending Almost Due South



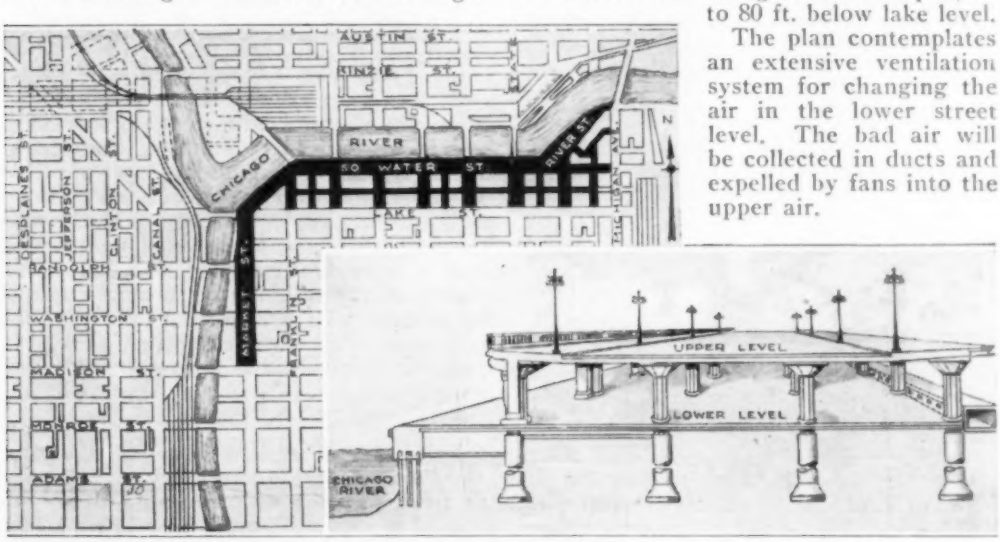
BY COURTESY OF THE CHICAGO PLAN COMMISSION

**The South Water Street Improvement as It is Planned: The Upper Level of the Viaduct will Be a Boulevard, While the Lower Level will be Given Over to Trucks and Wagons**

on Roosevelt Road, and will be particularly favored as regards approaches. It will contain all modern and necessary conveniences, and will be of a dignified style of architecture in harmony with its surroundings. The through service and suburban service will be entirely segregated, the suburban tracks passing through a tunnel under the station. This plan will allow the system to be linked with the subway system when built.

The third great project, while still in a tentative stage, deals with the improvement of the river front and the modernizing of South Water Street. This plan calls for the widening and double-decking of approximately a mile of city streets and the razing of six acres of buildings. The present street will be lowered to a point 5 ft. above lake level, with the upper level, or viaduct, 20 ft. above the lake. All intersecting streets will rise on easy ramps to this upper level, affording approaches to the bridges over the river. The lower level will be used for heavy traffic and will provide space for three lines of trucks moving in each direction, with additional space for backing up to a continuous 8-ft. loading platform adjacent to the buildings. North of the driveways will be a 25-ft. space along the river for boats to load or discharge passengers and freight. The viaduct floor will be of reinforced-concrete flat-slab construction, supported on columns which will rest on caissons extending to the hardpan, 60 to 80 ft. below lake level.

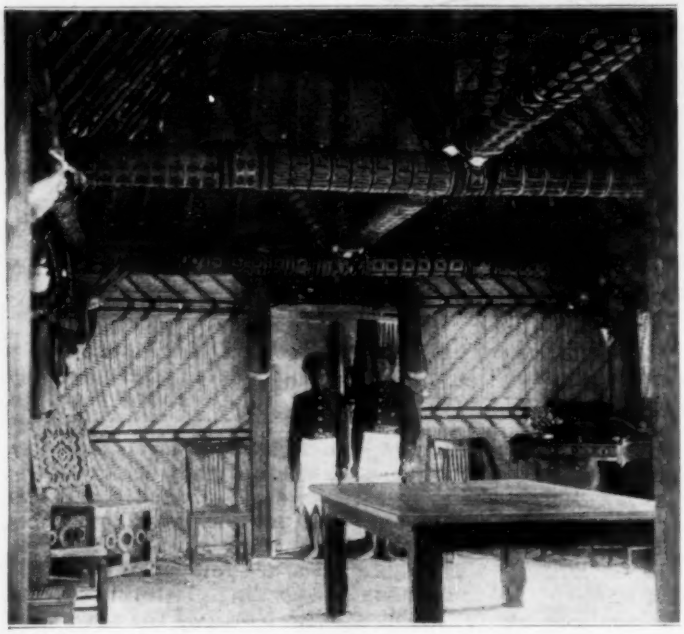
The plan contemplates an extensive ventilation system for changing the air in the lower street level. The bad air will be collected in ducts and expelled by fans into the upper air.




**Left: The Black Lines Show the Location of the South Water Street Improvement, Extending from Michigan Avenue to Market and Madison Streets. At the Right Is a Sectional View of the Two-Level Roadway. There Is Space along the River for Unloading Boats, and a Loading Platform Adjacent to the Buildings**

## INTERIOR HOUSE DECORATIONS OF FIJI ISLANDERS

The natives of the Fiji Islands build comfortable and substantial dwellings and

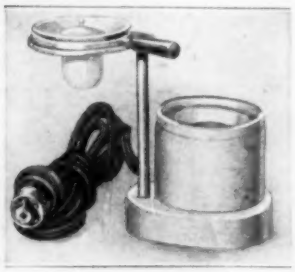


The Walls and Ceiling of This Fiji House are Decorated with Strings of Coconut Fiber Plaited into Various Artistic Designs and Dyed in Black and White

take great pride in their decoration, showing a high degree of artistic taste in this direction. The interior decorations are mostly of coconut-fiber strings plaited into various designs, black and white dyes being used to produce artistic effects.

## DRUG-DISSOLVING APPLIANCE ELECTRICALLY HEATED

Dissolving drugs for the aid of dentists and doctors who avail themselves of the use of local anesthesia, has been simplified by the invention of a small electric heater. This appliance is adapted for 110-volt alternating or direct current, and eliminates the handling of matches and alcohol, thus doing away with the often objectionable odor of the latter.



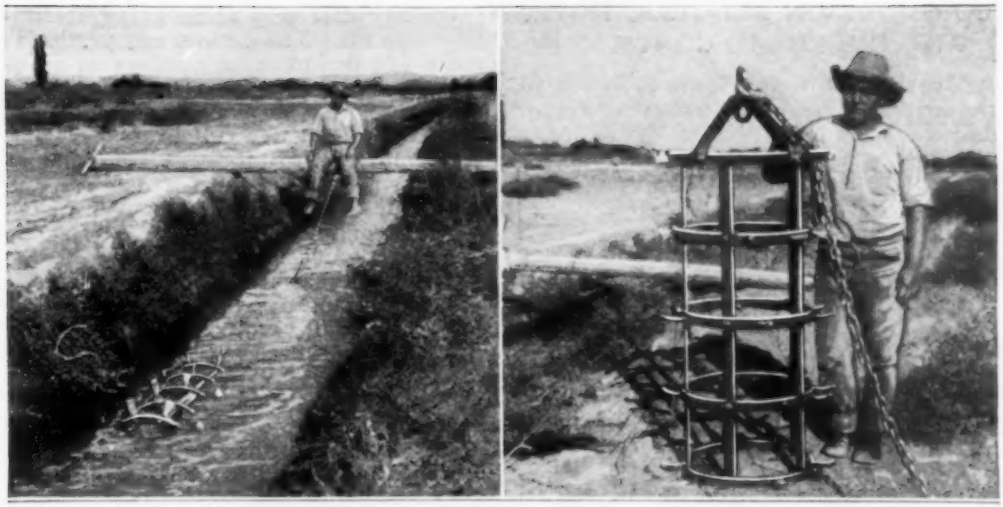
## DISCOVER CAUSE OF IGNITION OF ESCAPING HYDROGEN

There have been so many cases of spontaneous ignition of hydrogen gas when charging balloons that an investigation has been carried on to determine the cause. Various experiments were performed, such as allowing the gas to escape under pressure through different kinds of orifices, to determine if friction were responsible for ignition, but these experiments gave negative results. Finally, by observing in the dark a jet of hydrogen escaping through a pipe flange, it was found that a brush discharge of static electricity was plainly visible. When the pipe was tapped, to stir up the dust, an explosion occurred. From the investigation it would seem that the spontaneous ignition was due to the friction between the hydrogen and the dust of iron rust and to the brush discharge of static electricity from the electrified particles.

## NEW DYE COLORS ARTIFICIAL SILK BUT NOT COTTON

It seems probable that the discovery of a new dye by a British concern will have an important influence on the dyeing industry, for this dye has the peculiar property of coloring artificial-silk fabrics without affecting cotton. Should a mixed fabric of cotton and silk be dipped in this dye, the silk will take the color. The cotton in the fabric may then be colored by washing in a dye that affects only cotton. This combined dyeing makes it possible to produce a party-colored effect in mixed fabrics after they are woven.

¶Experiments are being conducted at the Forest Products Laboratory of Canada to find a means of preventing decay in stored wood pulp used in making news print. Storage of the pulp in water has given such favorable results that a trial will be made on a commercial scale.



Left: In Operation, the Sluicing Machine is Dragged Back and Forth along the Ditch and Stirs Up the Soil, Which is Carried Away by the Water. Right: The Device Is of Simple, Sturdy Construction, and Has Blades for Loosening the Soil along the Ditch

## HANDY MACHINE MAKES WATER DO THE DITCH DIGGING

Digging drainage ditches with water at a cost that is but a fraction of the usual amount has been accomplished near Vale, Ore. This feat was made possible by the invention of a sluicing machine by one of the farmers of the community, working at the suggestion of the Oregon Experiment Station.

To dig a large main drain by this method, a few furrows are plowed along the line of the proposed ditch. Then a large head of water is turned in at the upper end, and the sluicing machine is dragged back and forth along the bottom of the ditch by means of a horse at either end of a cross pole. The machine is built much on the order of an overgrown threshing-machine cylinder, and is heavy enough to dig up the bottom of the ditch and allow the water to wash away the soil thus loosened. Ditches, 6 and even 7 ft. deep, have been dug with entire success by this method, the only requirement being that there be plenty of water available and that the soil be anything but the heaviest clay.

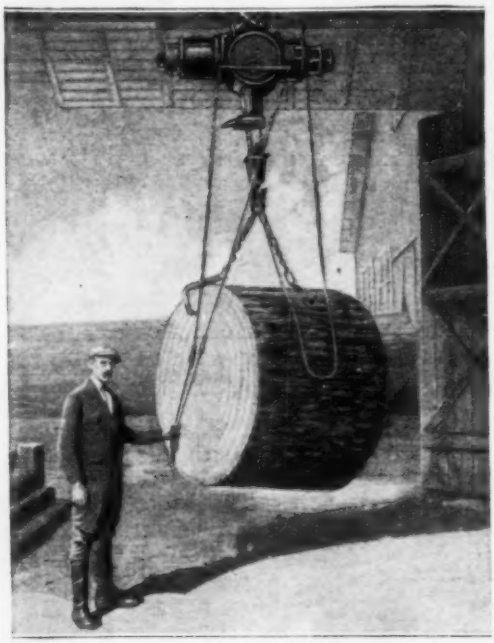
## TWO NEW AIRPLANE CAMERAS DEVELOPED BY EXPERTS

Camera experts at McCook Field, near Dayton, Ohio, have recently developed two airplane cameras that are of unusual interest. One type, which is used for extreme high-altitude photography, has an over-all length of 5 ft., and, on account of its unusual focal length, can be used at heights where the regulation camera would be useless. The other type is a triple-lens camera which can be used at lower altitudes for mapping work, and is of more conventional size. It can be used in standard airplanes for checking hydrographic surveys or similar work.

The Huge Camera at the Left, Due to Its Unusual Focal Length, can be Used at Very High Altitudes. At the Right Is the Triple-Lens Camera for Mapping

## COMBINATION ELECTRIC HOIST AND OVERHEAD CONVEYOR

A combination electrically driven hoist and overhead traveling-trolley conveyor that runs on the bottom flange of a



Combination Electric Hoist and Overhead Trolley Handling a Six-Foot Section of a Redwood Tree between the Mill and a Steaming Vat: The Control Is in the Operator's Left Hand

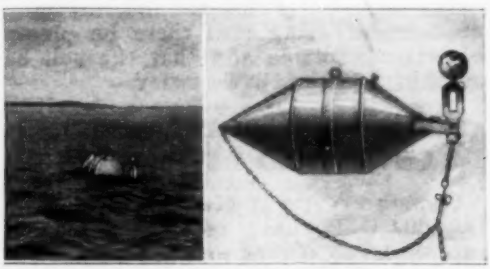
standard I-beam, is now on the market. The hoist, controlled by suspended cables, lifts loads up to 2,000 lb., and by means of another suspended cable, a single operator can move these loads from place to place. The working parts of the hoist are inclosed in an oil-tight case, so that they are at all times thoroughly lubricated. The hoist can be equipped with single or variable-speed control, the latter having 11 speeds. All parts are easily accessible by the removal of a few bolts. The trolley is adjustable to fit any standard I-beam, and the wheels are mounted on roller bearings.

## TRY CONTROL OF STREET-CAR STOPS BY COLOR SCHEME

Some novel suggestions for improvements in street-car service are contained in an invention that has been submitted to the Toronto transportation committee and which will be given a trial. The principal feature of the invention consists in so marking and arranging the cars that successive cars stop at progressively different points. The cars on any particular route are designated by means of numbers, signals, or otherwise, in groups of two, three, four, or more, as required, and the stops designated accordingly. Thus, if there are three forms of cars designated by a color scheme of red, green, and yellow, the stops will be arranged in the same way, and a car will stop only at the station carrying a corresponding designation—red car at red stop, green car at green stop, and a yellow car at a yellow stop. The public will know that like cars will stop only at like stations. A man may not be able to stop just at the street he desires, but with a three-color system he can be only one block away from the street at which he desires to alight. The inventor claims that his scheme will allow faster speed, as practically two-thirds of the time wasted in stopping will be eliminated, and that a great annual saving in cost will accrue to the transportation commission, while congestion of ordinary vehicular traffic will be in a great measure relieved, which is something to be greatly desired in the larger cities.

## SHARK-FISHING APPLIANCE HAS INDICATING FLOAT

Shark fishing is a profitable occupation, due to the many uses to which the bodies of these sea monsters may be put, and a Florida man is the originator of a new method of catching them. His outfit consists of a float in which a quantity of blood may be placed and ejected one drop at a time, and which has an indicating ball, pivotally mounted, at one end. At the other end of the float, a chain with the baiting hook upon it, is attached, this chain also being suspended from the indicator by a piece of twine. When the shark seizes the bait, the pulling force breaks the twine and allows the indicator to swing to a horizontal position, thus giving visible evidence of the catch.



When a Shark Takes the Bait, the Buoy Changes Position and the Indicating Ball at the Right Signals the Fisherman

# FOUNDATIONS FOR NEW THEATER PLACED WHILE PLAYERS PERFORM

By EVERETT J. LOVETT

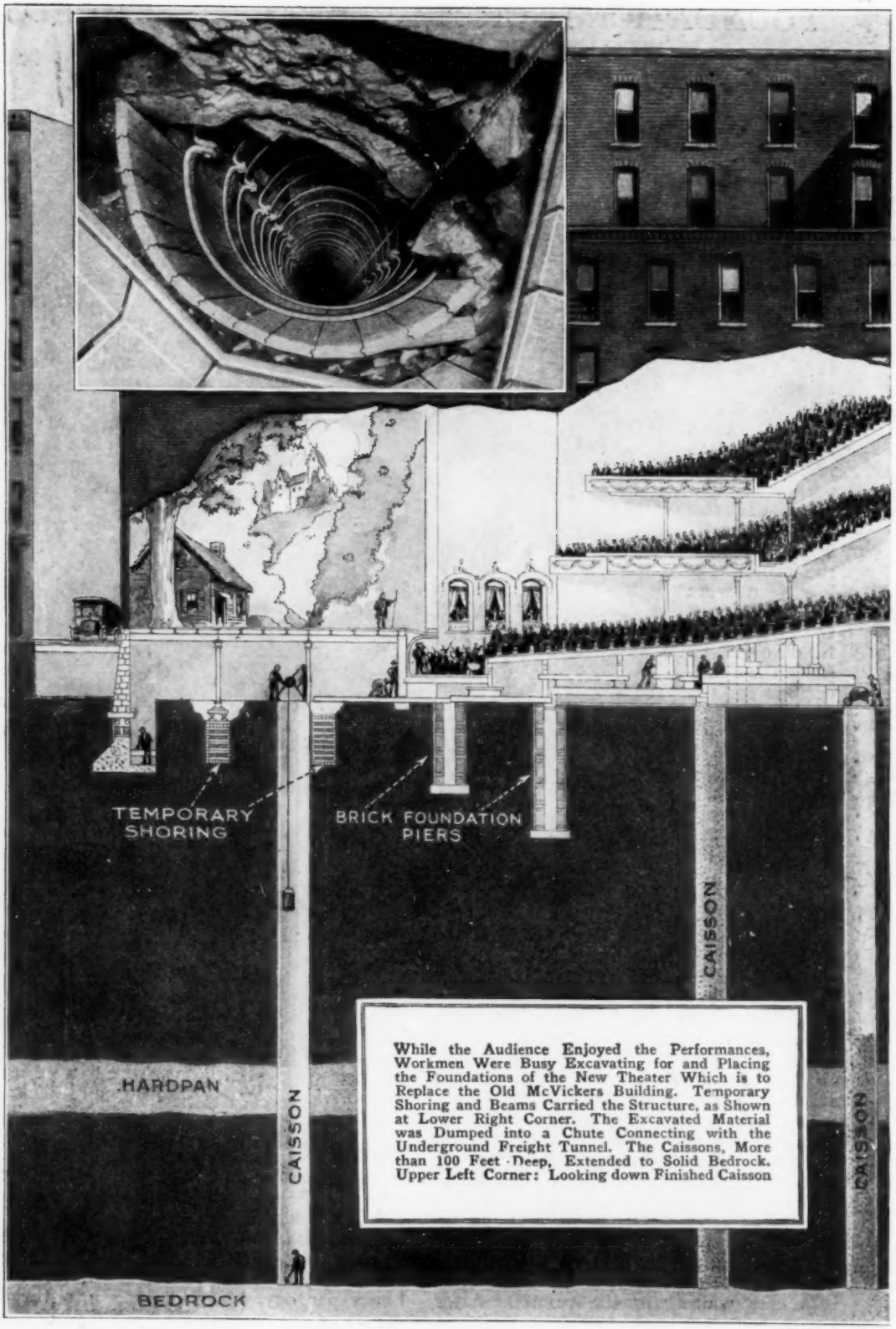
EVEN in a time when the extraordinary has become the commonplace, some feat will stand out as being worthy of more than passing notice. In this class belongs the task of placing the foundations for the new theater that is to replace the old McVickers building in Chicago. Probably none of those who enjoyed the performances in the theater during the early part of this year realized that the solid and substantial building in which they sat was resting on temporary foundations of steel and wood, while deep in the ground below men were digging down to the solid bedrock to place the foundations for the new building.

The Old McVickers Theater Building, Where for More than Four Months, Daily Performances were Given While Workmen Toiled Far Below Placing the Foundations for the New Building

Before the actual work started, careful and precise calculations were made to determine the proper method of placing the beams that would support the building during the time the excavations were being made. Some idea of the magnitude of this task alone can be gained when it is recalled that twice each day some 2,000 persons were admitted to the theater, and that they constituted what is called a "moving load," of first importance in all calculations both from an engineering and a safety standpoint.

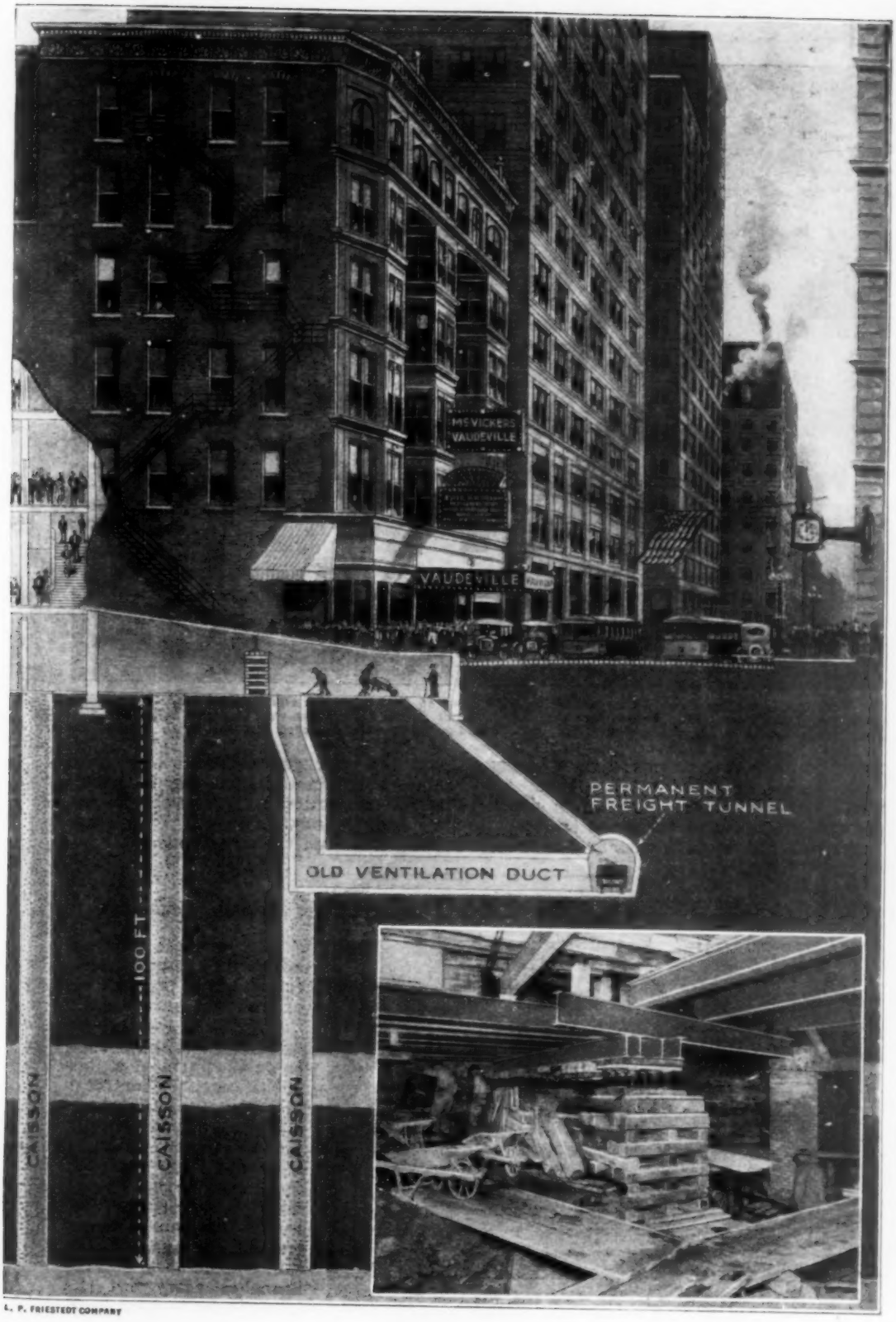
When the actual work started, a chute was cut from the basement of the building to the freight tunnel which passes along Madison Street about 40 ft. below the surface. All material excavated was handled through this chute and dumped into cars waiting in the tunnel. After the supporting beams were brought in and placed in position, the excavations were started, and permanent piers built up. Excavations were made under the walls, and the footings for the new walls were poured and placed. When these had set sufficiently, jacks were placed below the standing walls, and this weight was used to settle the new foundations until no movement could be noticed, after which the new walls were built up to the ground level. During this time the caissons were being sunk to the limestone bedrock, 100 ft. below. These caissons were 4 and 5 ft. in diameter and were filled with concrete, forming solid pillars upon which the new theater building will rest. The pouring of the concrete in each of these caissons was done continuously, the material being delivered from the alley at one side of the building. The delivery of this material was the only hint the public had of the work that was going on below. The proscenium wall and steel curtain, weighing together some 700 tons and extending to the sixth floor, were carried on an individual set of shoring and jacks, and the new proscenium wall, about 20 ft. back of the old one, was constructed without interfering with the performance. Because of the difference in elevation, it was possible to build the new stage almost directly below the rear of the old stage, and all this was done before the playhouse closed its doors.

The foundation work went forward 24 hours per day, being divided into three shifts. Care was taken in so planning

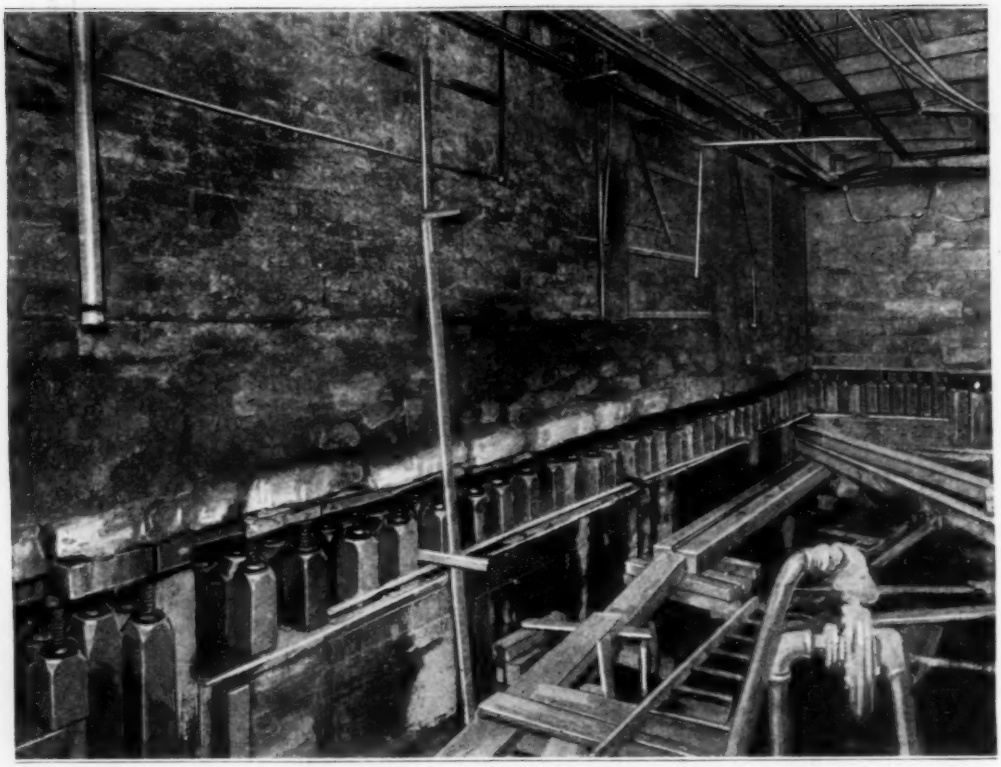



While the Audience Enjoyed the Performances, Workmen Were Busy Excavating for and Placing the Foundations of the New Theater Which is to Replace the Old McVickers Building. Temporary Shoring and Beams Carried the Structure, as Shown at Lower Right Corner. The Excavated Material was Dumped into a Chute Connecting with the Underground Freight Tunnel. The Caissons, More than 100 Feet Deep, Extended to Solid Bedrock. Upper Left Corner: Looking down Finished Caisson

PHOTOS BY COURTESY OF




L. P. FRIESTEDT COMPANY



The Foundations for the New Walls were Built Some 12 or 15 Feet below the Old Foundations, and by Using Jacks, and Checking with Precise Leveling, the Weight of the Old Walls was Used to Settle the New Foundations Until No Movement was Noted, and Then the Jacks were Removed and the Space Bricked Up

the operations that all pounding or noisy work should be done between midnight and 10 o'clock in the morning in order not to disturb the performance above.

As soon as the final curtain was rung down, the wreckers started to tear down the old building, and when this is accomplished, construction will start immediately on the new structure. No serious accidents marred the dangerous job.

## JAPANESE PINE TREE TRAINED TO FORM A BOAT

This Sacred Japanese Pine Tree, 600 Years Old, has been Trained on a Trellis and Grows in the Form of a Japanese Sampan

The Japanese have accomplished some wonderful results in the training of trees, in one case, by the use of a trellis, even causing a pine tree to assume the form of a Japanese sampan. The tree is a sacred pine, more than 600 years old, growing in the grounds of one of the temples. The trunk of the tree represents the mast of the sampan, the upper branches being trained to simulate the sail, while the lower branches carry out the idea of a hull of the boat.

# COMMENT AND REVIEW

[These pages were printed May 26, 1922.]

PARENTS have come to regard with disfavor any further additions to the already overloaded courses of study in public schools, some of which are more ornamental than useful. They will, however, favor the Ohio plan, which makes instruction in fire prevention compulsory by law in all public schools of the state, beginning with the kindergarten classes.

*Fire Prevention Taught*

In addition to the customary fire drill, scholars are taught the location and operation of fire-alarm boxes and how to send in a fire alarm; all about hand fire extinguishers, why and how they work, and how to use them; when to use water to put out a fire and when not to use it, and the proper, handy substitutes, like flour or sand; also instructions in the many ways to avoid fires, especially in and around the home.

The result of this training begun in childhood will enable even those of quite early age to know just what to do when a fire starts, and instead of going into a panic, which renders one helpless, they will be enabled to keep their head, because the mind will be occupied with doing the necessary and appropriate thing. The instruction will commend itself as extremely practical, and in years to come will result not only in much saving of life, but should tend to decrease the present fire loss in this country of half a billion dollars yearly. The city of Toledo has given the new course the name of "Citizen Training," and its Public Safety Committee has provided appropriate medals in recognition of unusual proficiency and accomplishment. The idea is so simple and practical that its adoption generally throughout the country should promptly follow.

WHILE no cement ships are under construction at present in this country, neither are there many steel or wood hulls being built. Steel and wooden shipbuilders continue strong in their disapproval of a "stone" ship, and constructing engineers are still divided in their views.

*The Cement Ship*

The cement ships built by the government during the war may fairly be classed with "Eagle" boats and wooden and steel hulls, many of which will never carry a cargo. On the other hand, the "Faith," the first cement ship built in this country, is in excellent condition and at present engaged in carrying cargoes.

It must be acknowledged the cement ship possesses wonderful strength. The tanker "Selma," which went on the rocks at Tampico, Mexico, was raised and towed to Galveston, a distance of 455 miles. It is true that for reasons largely local, it was found impractical to make the necessary repairs, and the ship was finally left in an out-of-the-way place by the Shipping Board, but beyond the hole in her hull the ship was as strong as ever.

Another example of the unusual endurance of these craft may be seen in the steamer "Polias," which in a blinding snowstorm went on a submerged ledge in February, 1920, three miles off Port Clyde light, Maine. The wreck lies broadside to the heavy waves which continuously come in from the open sea. In July of that year I went aboard and carefully inspected the entire vessel. The ship was as solid as the rock on which she rested; not a break or crack above or below decks, except where a sharp rock came through the bottom. Standing on the bridge 40 feet above the waterline, I could feel no tremor when the heavy seas struck her. An inspection a year later showed the same conditions, except that the paint was beginning to wash from her sides. The superintendent of the wrecking company declared either a steel or wooden hull in the same position could not have withstood the seas three months. Efforts during two summers to float her with air, however, proved a failure, and after removing the machinery, etc., other salvage was abandoned. It will be interesting to note how many years the hull will last.

While the experience with cement ships has not yet demonstrated a final success—for the accidents to the two ships mentioned would have happened had they been steel or wooden—their strength seems to have been completely established. It is also only fair to consider that these vessels were built during war times and for the first time. With a well-organized shipyard, the cost, which was

something less than steel, would be still further reduced; and early efforts, like the locomotive and automobile, are always somewhat crude. Possibly, with a resumption of shipbuilding later on, it may be found practical greatly to reduce the weight and make other modifications to advantage. The present state of the art of the cement ship, therefore, may be regarded as neither a positive success, nor yet a demonstrated failure, with the balance more in its favor than otherwise.

## *Radio*

RADIO, which is probably better understood by more boys and young men than by adults, has swept the country with a rapidity and intensity beyond precedent. Tonight probably no less than two million listeners will receive the concerts, lectures, and other forms of entertainment, broadcast from two score or more sending stations. The number of receiving sets in use in this country today is estimated at about three quarters of a million. As a stimulus to the study of electricity, it has already accomplished in six months more than all the textbooks in years. Factories turning out radio apparatus are running night and day, and are weeks behind on orders. Radio has become what is termed a "craze," for it has attracted both young and old.

Radio outfits as built today work with less efficiency during hot or humid weather; hence we may expect something of a let-down during July and August, but with the return of cooler weather people will return to it with new interest.

Like new gold and oil fields and boom towns, many extravagant claims are being put out for what radio will do, and thousands rush in during the first period of excitement. Then, gradually, there is a falling off for one reason or another, and the proposition gets down to fundamentals. The practical, commercial uses are increasing rapidly and already have reached a point where a Federal commission has been appointed to regulate the use of the air for transmission purposes in order to avoid chaotic confusion. So, at last, even the air is no longer wholly free. Improvement in construction and operation will, of course, come as time goes on; but like everything else mechanical, radio has certain limitations. What these limitations are no one knows as yet.

While we hear most of radio as an absorbing source of entertainment, its practical use for commercial purposes is already very large. A vast amount of press, business, and government work is now passing hourly across oceans, and a larger number of messages between cities than is generally known is being handled. In Europe its use in the home is much less than here, but regular service is maintained commercially between many cities.

In navigation its service has from the first been of paramount value, especially in bringing assistance to disabled vessels. The saving in both ships and human life at sea has been enormous, and on the Great Lakes, where ships are never more than a few hours from land, their operation is being still further safeguarded by the establishment on shore of naval radio-compass stations. In times of fog, the signals from these stations reach farther from land than light or foghorns, and are more accurate. By this means vessels are able to avoid danger points, and during fog to travel in lanes which cannot be widened, and proceed and pass with far less danger to themselves and other craft.

If the efforts being made to transmit pictures by radio are successfully worked out, it will put a great advantage into the hands of the authorities of the law, and the likeness of known criminals, at least, can be shot through space even faster than the high-speed automobiles in which they now so easily make their escape.

Its use commercially in this country will eventually, in all probability, be its larger function. Already some country banks and stores have installed sets for the purpose of receiving market reports for their farmer customers. This feature is still scarcely developed. Stranger things have happened, but it seems unlikely, however, that it will ever displace the wire circuits of city and long-distance telephones where both privacy and certainty of operation are indispensable.

It is interesting to watch the development of these new things, all of which seem automatically to be immediately drafted into military service. As soon as one nation devises something new in the way of attack, others quickly study out a method of making it ineffective—hence, armor plate to resist heavy gunfire, anti-aircraft guns, masks for gas, and so on; and now "radio scrambling" is announced to render the communications of the enemy unintelligible. Thousands

of people are being entertained; others instructed; the blind, bedridden, and infirm now have concerts, lectures, and sermons brought to them. It is doing a great work, which doubtless has far from reached its limits.

SOME timid mothers, on reading the reported death of three children in a burning house, and knowing less of radio than their small boys, have allowed themselves to worry unnecessarily over the receiving sets in their own homes. With the hundreds of thousands of installations made by amateurs, whose chief aim in life was to get their receivers working at the earliest moment, and with a cheerful indifference to any possible danger, the wonder is there have not been scores of incipient fires. That there is some element of risk where installations are improperly made, is indicated by the recommendations now announced by the National Board of Fire Underwriters, and an observance of the few simple suggestions made should insure complete immunity from fire risk.

*Radio Fire Risk Avoidable*

Aside from a possible attraction of lightning to outside antennæ—against which a simple lightning arrester placed out of doors will safeguard—the chief risk seems to be in the careless stretching of wires across or near wires carrying more than 600 volts, and specially the high-voltage lines of street-railway and other public-utility wires. Warning is also given not to experiment with lighting circuits, and to avoid poorly connected or cross leads from storage batteries; the latter have caused several fires. Outside antennæ should be constructed in a substantial manner to avoid contact by accidental sagging or swaying in the wind, and all joints should be securely soldered. Inside antennæ are not subject to these dangers. Lead-in wires should enter a building through a noncombustible bushing and should not be smaller than No. 14 B. & S. gauge. Experience has shown that more than once even six-volt batteries are capable of starting fires, and special stress is laid on not charging batteries from the electric-light current in the home, nor to receive messages via the house-lighting circuit.

It will be seen from the above that the precautions are really very few and simple, but should be followed to insure payment on a fire-insurance policy in case of fire. With any receiving set the principal danger comes from lightning brought in over the equipment. Where there is no exterior antenna, this hazard is removed. If in doubt, ask any insurance man. Radio is too good to be made the goat of careless or ignorant installation.

MORE and more our manufacturers are coming to recognize the growing demand on the part of the public for a higher standard of art in manufactured products. Thus far there has been comparatively little consistent effort to train an army of artists, designers, and craftsmen beyond the elemental stage. Each manufacturer has practically had to train artists for his own particular need, or, as has been done to a large extent, copy from foreign manufacturers or import artists from abroad. Naturally the successful operation of a large plant is what appeals first of all to the producer, and in most cases the ability to manage a large business does not carry with it an equal ability to train designers. In other words, the two processes, while most intimately connected in producing an article, are actually very different things in execution. To teach designers requires facilities and instructors that are just as complete and competent in their line as the manufacturing process must be complete, with its choice of most efficient machinery and the best possible arrangement of it to prevent lost motion as the raw material is carried through to the finished product. We have paid great attention to efficiency in these matters, but have neglected a constant supply of new art designs of the best and highest order. Obviously no better pattern will emerge from a loom than is given the loom to weave.

*Art in Industry*

For a long time some method for improving conditions has been talked of and is now about to materialize. In Chicago, a strong association of manufacturers has been organized for the purpose of establishing a training school for artists, designers, and craftsmen. Also, another is forming at Newark, N. J. It is the intention to gather from all parts of the world notable examples of cloths,

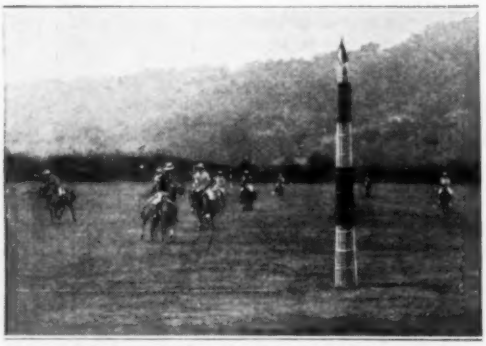
tapestries, laces, jewelry, all forms of interior decoration, and specimens of all kinds of work that has to do with industrial art. Instructors will be carefully selected for their special fitness in each of the many varieties, and students will be taught not only the general principles of the arts, but will be encouraged to select some one line for which they show special inclination and aptitude, and to specialize in that particular branch. This will not only open up new avenues of occupation for the artistically inclined, both men and women, but in a few years will provide the manufacturer with carefully trained artists who are not merely artists, but who have been taught how to combine art with the practical uses of production, and who are expected to bring to their work that initiative which is so greatly prized. And when the plan is well in operation, our standard of industrial art should be raised to a level which will not only be appreciated in the home markets, but largely increase export sales.

This country possesses one great advantage over others in such efforts, in the fact that Americans are so adaptable, and not likely to handicap themselves by hidebound traditions; and wherever efficiency permits, make short cuts to the final result toward which an effort tends.

H. H. WINDSOR

## GOAL POST MADE HARMLESS AT HONGKONG POLO CLUB

To protect both horse and man from the obvious danger that must exist in the game of polo from the liability of collision, the goal post on the grounds of the



Polo Goal Post Made Entirely of Bamboo Baskets, and So Constructed That It is Knocked Over in Case of Collision, without Injury to Horse or Rider

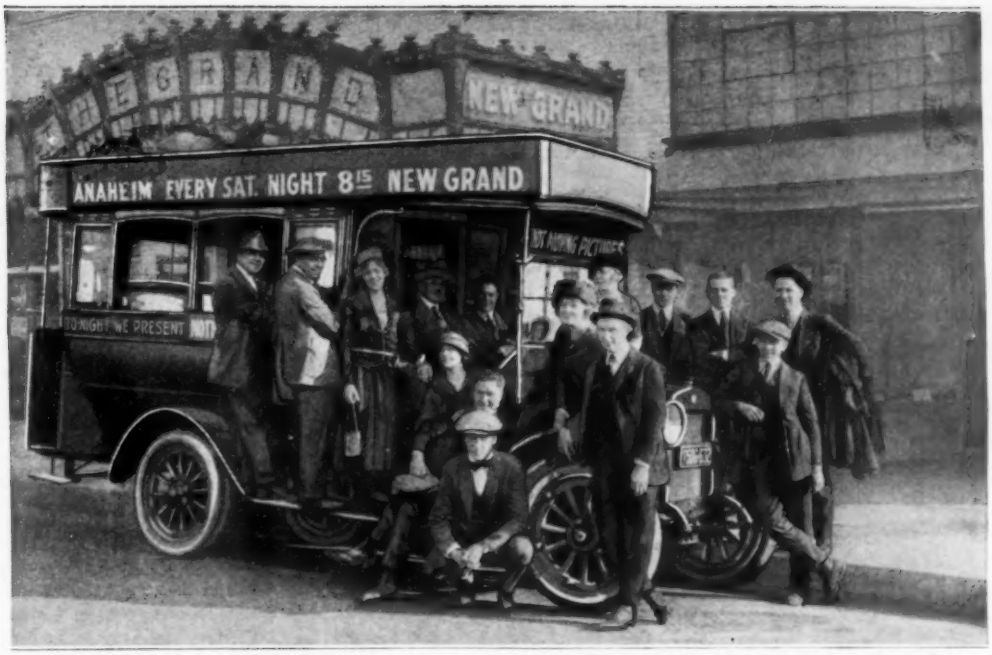
polo club at Hongkong, China, was built of delicately constructed bamboo baskets, so that in case of collision it would be easily knocked over. A particular inducement to adopt this harmless kind of goal post was the visit to the club of the Prince of Wales.

¶ Because of the decreasing value and unsatisfactory character of the mark as a medium of exchange, the people in some parts of Germany are reverting to the ancient principle of trade by barter.

## COMPACT DEVELOPING OUTFIT CARRIED IN POCKET

Developing outfits are numerous, but one of recent introduction has several features incorporated in it for the benefit of the tourist-traveler and vacationist. The complete kit weighs only 1 lb. and measures 1¼ by 4¼ by 6½ in. when folded in the case, so that it can be carried in the pocket. All roll film from the "vest-pocket," eight-exposure type, up to and including the 3¼ by 5½, six-exposure size, are quickly and easily developed by the aid of this outfit in broad daylight.

Above: Developing Kit with the Case Shown Open and Closed. Below: Bag Cut Open So That the Two Hands can be Seen Unrolling the Film

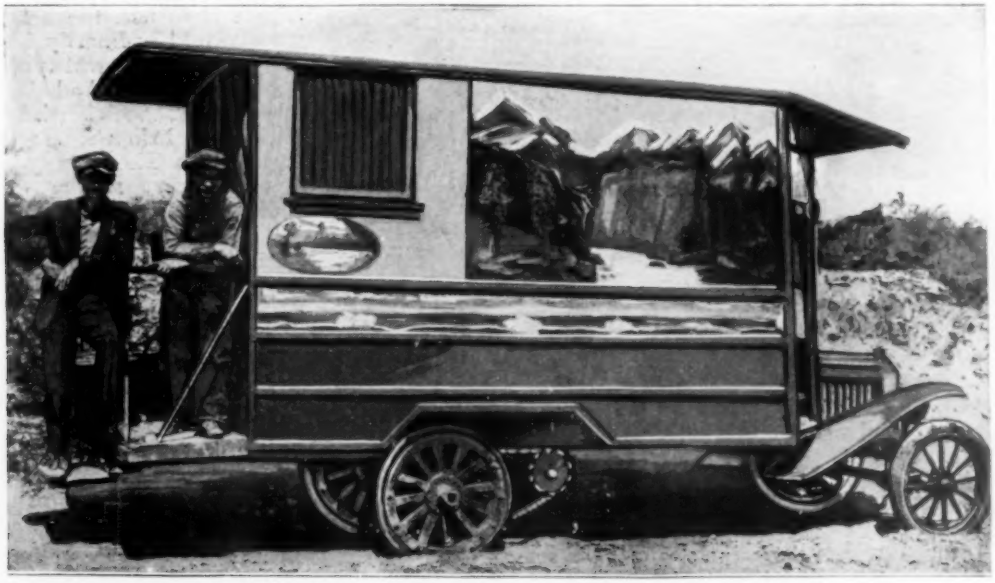



The Traveling Stock Company of Players and Their Auto Bus Ready to Leave for One of the Near-By Towns Where They will Give a Performance: After the Show They Return to the Home Town for a Good Night's Rest

## STROLLING PLAYERS USE AUTO BUS FOR TRAVELING

The combination of gasoline and good roads is accomplishing wonders for the theatrical business in several of the southwestern states, for the motor bus has stepped in and made it possible for showmen to form "wheels" in suburban cities and country towns which could not be played by stock companies a few years ago because of the poor transportation facilities prevailing.

One well-known eastern theatrical man has been using a truck in Los Angeles



Auto Truck Used by a Traveling Vaudeville Troupe Playing the Smaller Towns in Arizona and Texas: Scenic Paintings on the Sides of the Truck Serve to Call Attention to the Show

and Orange counties, California, with marked success. He has a staff of 15 members, 11 of whom are players, and with this troupe he plays around a wheel each week, giving Anaheim, Santa Ana, Corona, Whittier, Orange, and La Habra good shows at fair prices. Two nights a week the company plays in Anaheim. It plays one night a week in each of the other towns. Corona, 40 miles away, is the most distant point. The company drives over there from Anaheim in the afternoon, gets set for the night show, puts on a performance, and hikes back to Anaheim in an hour and a half after the curtain goes down. Every night it plays a new town, but always it gets home to Anaheim to sleep in a comfortable bed. This eliminates the discomfort of hotel beds in country towns.

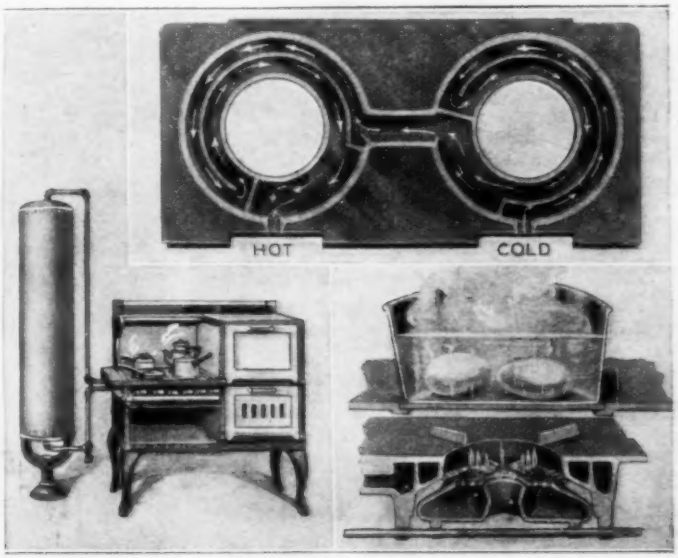
The company carries all the scenery and baggage it needs on a trailer. The truck has a bus body with seats to accommodate the entire troupe. In the matter of handling scenery, the company enjoys great advantage when traveling by truck, because it can take the "drops" right with it to the theater door, eliminating drayage cost, and getting away from the trouble of checking baggage, to say nothing of the saving in wear and tear by doing away with four extra handlings.

Only a few weeks ago a vaudeville company, playing country towns, especially through Arizona and Texas, where "big time" vaudeville is hard to get because of poor transportation facilities, was seen touring the country between Phoenix and Imperial Valley in an auto with a delivery body. The sides of this body were covered with canvas, and these canvas areas were covered with scenic paintings which attracted considerable attention, and served, in some degree, to advertise the company as it journeyed along.

In southwestern Colorado there is a motion-picture showman who has a wheel of motion-picture theaters in country towns about 50 miles apart. After billboarding one show as he goes along with another, he takes a new release and starts over his circuit, making one town a day till Saturday night. He drives home Sunday, picks up the film for next week's show, and makes a new start over the circuit, stopping at billboards along the roads each day to paste up a few "three-sheets" announcing next week's show, for the information of his scattered patrons.

## GAS BURNER COOKS AND HEATS WATER AT THE SAME TIME

It will no longer be necessary to have a separate unit for heating water in the storage tank, if a newly designed gas-range burner is adopted. The burner is supplied with an annular space around the flame, and this space is directly connected to the hot-water tank. When the range is in use, the heat that would ordinarily be wasted in the open-type burner is absorbed by the water, which then circulates into the storage tank. The arrangement is very similar to the standard waterback of the coal range. The operation of the burner for cooking on top of the stove does not differ from the regular open-type burner.




Above: The Arrows Show How the Water Circulates in the Space Surrounding the Burners. Below: The Gas Range Connected to the Hot-Water Tank, and a Section of the Two-Purpose Burner

¶Submarine pipes from the Sarawak oil wells carry the oil out to depths that will accommodate the largest vessels. One of these pipes is 14,555 ft. long, and believed to be the longest of its kind in the world.

The Horse-Drawn Fire Engine Making Its Last Appearance in a Parade to Signalize the Complete Motorization of the Detroit Fire Department: With Bell Ringing and Whistle Blowing, the Apparatus Drawn by the Magnificent Team Led the Procession. The Team at the Right Also Took Part in the Procession

## FIRE HORSES MAKE LAST RUN AS FEATURE OF PARADE

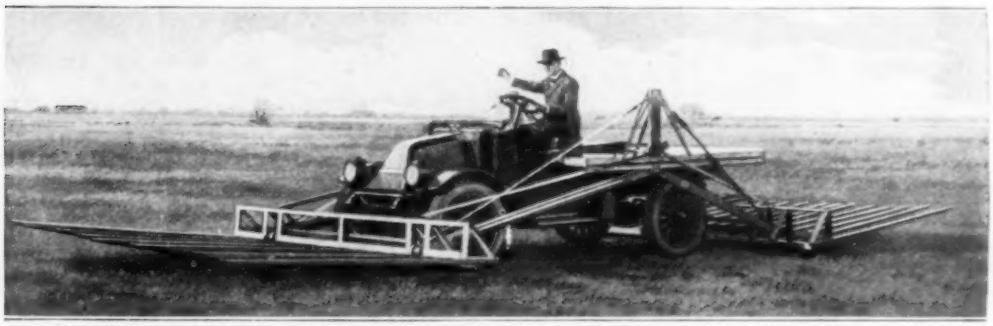
Making their last spectacular run, teams of fire horses dashed down one of the main thoroughfares of Detroit, recently, before thousands of spectators who had gathered to witness a parade of the city's fire-fighting equipment. Complete motorization of the Fire Department is responsible for the passing of the faithful animals. They have been turned over to the park commissioner for use on light hauling work.

## HAYRAKES ON MOTOR TRUCK FUNCTION EFFICIENTLY

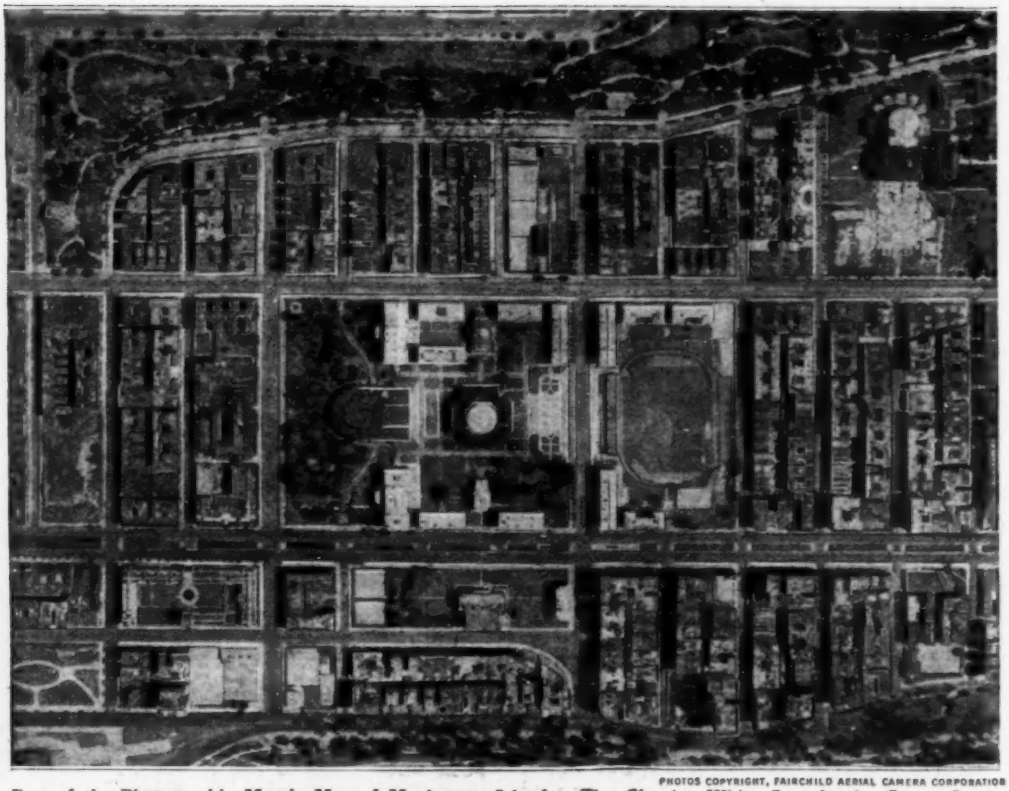
Two hayrakes attached to a frame which is suspended from a platform, that in turn may be placed on an ordinary motor truck, constitute the invention of a Kansas man. The rakes are of equal size, normally self-balanced, and being positioned close to the ground, they function efficiently in rapid loading of the hay.

## PUBLICITY IS DEMONSTRATED AT ENGLISH EXHIBITION

Publicity, that necessary adjunct of successful business, had its worth practically demonstrated in an original manner at an English exhibition recently. A miniature railway system, operated by electricity, was installed and served to direct attention to the many commodities that could be profitably transported in the cars. Likewise were illustrated numerous kinds of advertising signs and posters which could be erected in stations, along the right of way, on fences, and on bridges.



The Rake Attachment Which may be Suspended by a Frame from the Body of an Ordinary Motor Truck and, Because of the Low Position, Functions Efficiently as a Rake, and Permits Rapid Loading of the Hay



PHOTOS COPYRIGHT, FAIRCHILD AERIAL CAMERA CORPORATION

**Part of the Photographic Mosaic Map of Manhattan Island: The Circular White Spot in the Center Is the Dome of Columbia University Library. Along the Top of the Picture Is Morningside Park. In the Upper Right Corner Are the Seven Chapels of St. John the Divine, with the Foundation of the Cathedral Just Below**

## EFFICIENT HIGH-SPEED AERIAL CAMERA

Aerial photography has been greatly developed since the war, when it was first put into practical use, and a notable instance in connection with this development is a new aerial camera which has recently given a remarkable demonstration of efficiency in the production of a photographic mosaic map of Manhattan Island. A hundred exposures taken at an altitude of nearly two miles resulted in a map, 8½ ft. long and 28 in. wide, showing more than 32 square miles of New York City, with every object, even to the pedestrians, plainly portrayed.

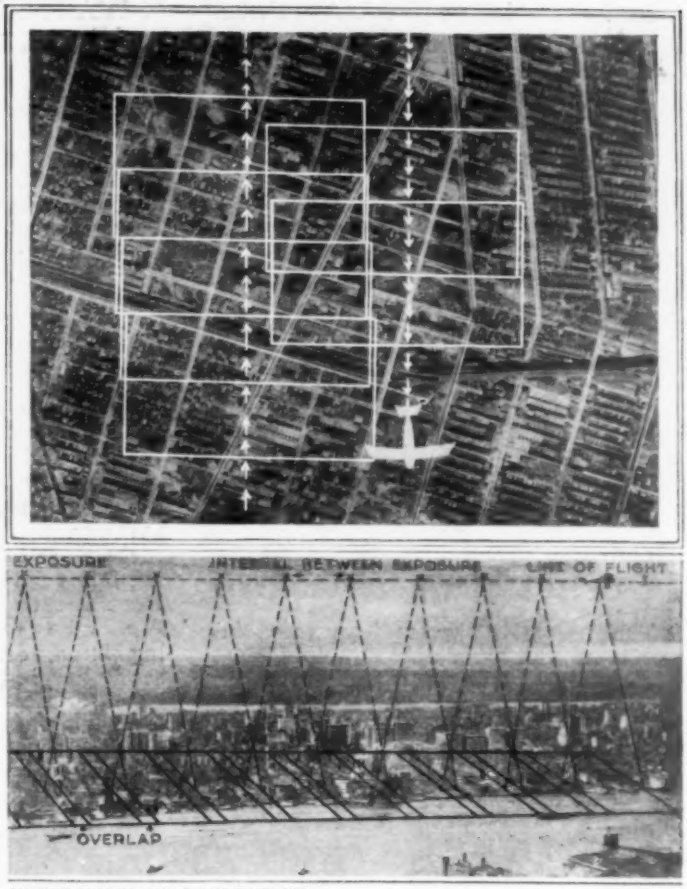
**Large High-Speed Aerial Camera, with the Lens End Below, and Above, the Spools on Which the Film is Wound by the Electric Motor Seen on the Left Side**

The machine that made this possible is a large camera, weighing 36 lb., which uses a film similar to that of any ordinary camera, though very much larger, and having an electric timing device that regulates the exposures in proper relation to the speed of the airplane from which the camera is operated. Inaccuracy that would result from the continuous movement of the airplane is prevented by the use of a new kind of shutter that operates between the two lenses of the camera, and exposes the entire plate in 1/150 second—such a short period that the exposure is entirely unaffected by the movement of the airplane.

The new camera is equipped with an automatic device for regulating the intervals between exposures in accordance with the speed of the airplane. By means of another innovation the roll film is held without vibration.

## INVENTION PROMISES SECRECY FOR RADIO MESSAGES

Considering the wonderful advance that has been made in radio communication during a comparatively limited time, it is only logical to expect some development that would insure secrecy for radio messages. It is now announced that one of the foremost radio experimenters of this country has produced a simple device which prevents any but authorized stations from receiving broadcast messages. Several messages may be sent at the same time on a single wave length, and the apparatus reduces the possibility of accidental interference and also the effects of static disturbances.

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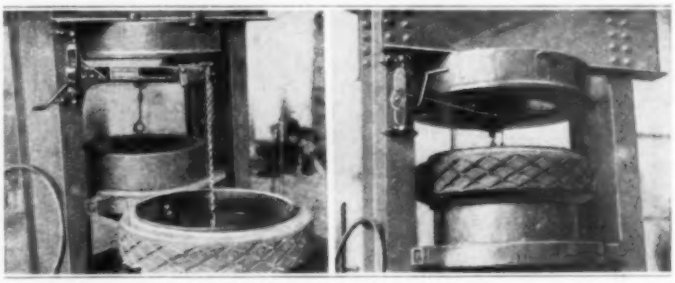
Diagram, Showing How 32 Square Miles of Manhattan Island were Plotted and Photographed in 69 Minutes with a Modern Aerial Mapping Camera: Above Is a Plan of the Area, Showing Route of Airplane and Successive Exposures. Below Is a Diagram Showing the Method of Procedure

## TIRE-PRESS BRACKET HOIST SAVES TIME AND LABOR

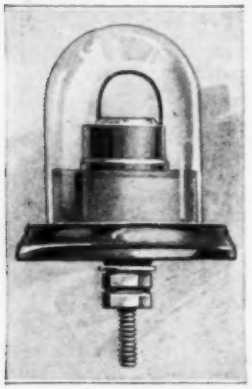
By means of a bracket hoist, recently developed in San Francisco, one man can operate a press for the heaviest solid truck tires in less time than it could be done by two men in the ordinary way. The hoist is self-adjustable, and can be applied to any size or type of hydraulic press. It consists of a swiveled bracket connected to the side of the press, and fitted with a small winch. This is operated by a crank handle that winds up a chain from which the wheel is suspended. The tire is first centered on the wheel, which is then hoisted to the proper height, swung under the press, and lowered onto the platen. Then the press is started.



Left-Hand View Shows How the Tire is Centered on the Wheel before Swinging It onto the Press, and at the Right It is Shown in Position Ready for the Press to be Started

## CRYSTAL DETECTOR APPEARS LIKE VACUUM TUBE

Resembling a vacuum tube in appearance, a new crystal detector is now being manufactured and placed on the market by an eastern company. The detector and fixed contact are inclosed in a glass case to prevent interference by moisture and dirt, and should prove popular with persons interested in receiving radio broadcasting from near-by stations.



## MOTHER SHIP AND HER BROOD OF SUBMARINE CHASERS

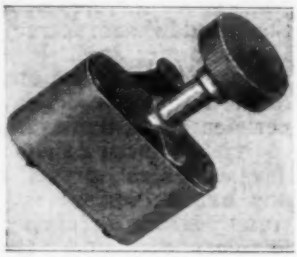
The submarine chasers, because of their small size, can carry only a limited supply of fuel oil, and have no facilities aboard for making repairs or renewals, and this has led to the development of the mother ship, used as a base of supplies. When the commander of a subchaser finds it necessary to replenish his supply of fuel oil, he ties up alongside the mother ship, from whose tanks the oil is pumped. It is not unusual for ten or more of the subchasers to be taking supplies at the same time.

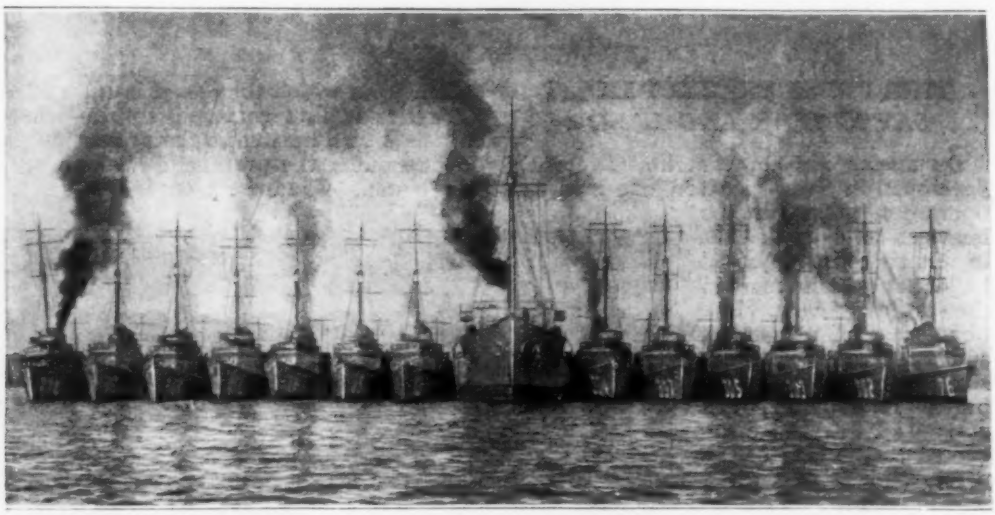
## STRANGE SUBSTANCE IN TEARS DESTROYS BACTERIA

A British scientist has made the remarkable discovery that human tears contain a substance that has the peculiar property of readily destroying microbes and bacteria. A small portion of tears introduced into a test tube containing countless bacteria quickly dissolved them. While the substance has not yet been isolated, it is known to exist in nearly all tissues of the body and also in some vegetables.

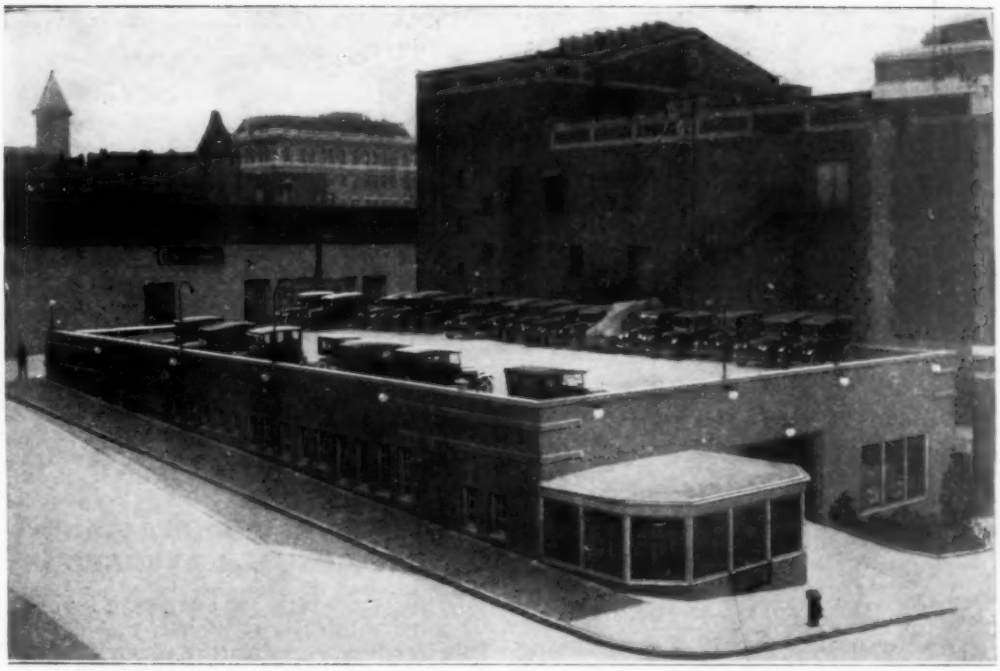
## FILAMENT RHEOSTAT MADE OF CARBON DISKS

Two small columns of carbon, or graphite, disks inclosed in a porcelain container, constitute the essentials of the latest filament rheostat. An adjusting knob, or screw, is provided for controlling the pressure on the disks, thus changing the resistance of the columns and thereby raising or lowering the amount of current flowing through the filament. The circuit is controlled by an internal switch that opens the battery circuit when the screw is released.





Like Chickens Gathered around the Old Hen, These Little Submarine Chasers Gather around the Mother Ship, from Which They Receive Their Supply of Fuel Oil



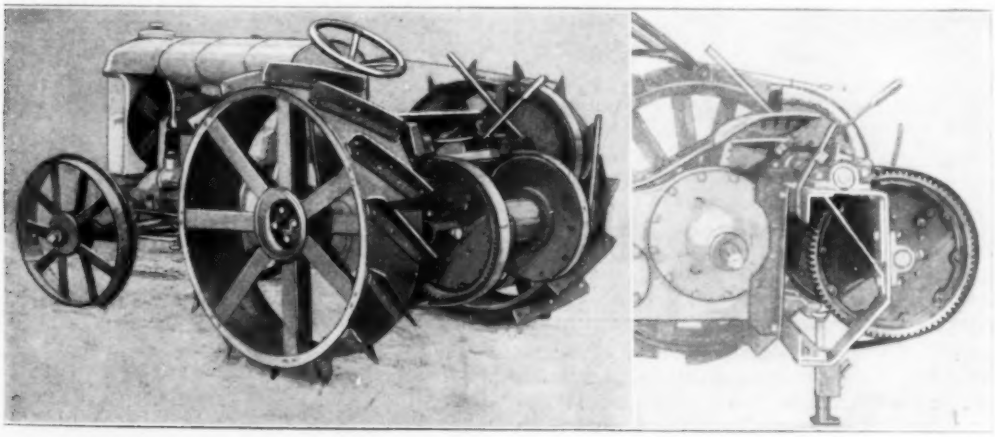
The Roof of This One-Story Garage in Seattle has been Made a Source of Revenue by Constructing It in Such a Way That It can be Used as an Outdoor Parking Space for 200 Automobiles

## USING THE ROOF OF A GARAGE AS AUTO-PARKING SPACE

As a means of utilizing the down-town space to best advantage, the owner of a one-story garage in the city of Seattle, Wash., has made the roof into an outdoor parking space. Advantage is taken of the hilly nature of the ground by making an inclined driveway from the side street to the roof of the garage. There is room for 200 cars in this unusual parking space.

## WINCH ERECTED ON TRACTOR PERFORMS HEAVY LABOR

Heavy labor of various kinds can be performed with the use of a winch which has been constructed on a common type of tractor, although the outfit was originally designed for service in the oil fields. The winch is mounted on the differential housing of the implement, the drum being driven direct from the pulley shaft by means of an easily attached

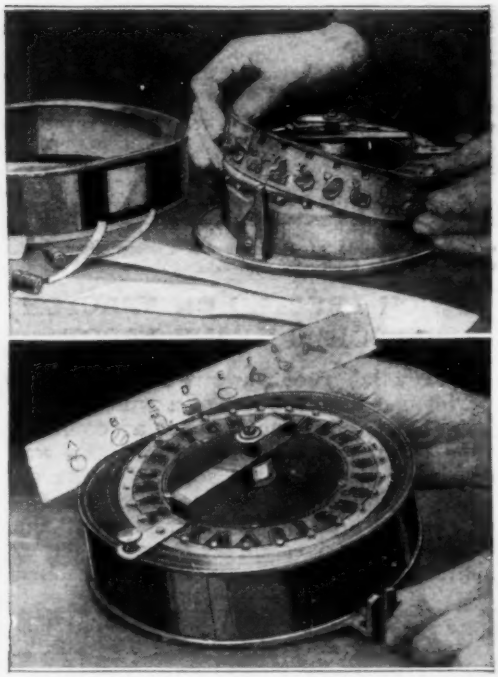


Left: Winch Mounted on the Differential Housing of a Tractor. Right: Traction Wheel Removed, Showing How Winch is Attached; It is Controlled by a Special Clutch Lever Independent of the Operation of the Tractor

sprocket, chain drive, and gears. The tractor transmission is thereby left idle, and all wear thereon is eliminated while the winch is in operation, all of which is accomplished without in any way interfering with the different maneuverings of the machine. The pulling capacity of the contrivance is six tons, direct pull, and 15 to 25 tons with the aid of a block-and-tackle arrangement. The drum holds 3,000 ft. of ⅜-in. steel cable.

## CHILD'S TYPEWRITER PRINTS LETTERS AND PICTURES

The education that children receive through games comes easily and without



A Child's Typewriter Which Prints the Letter and a Picture of Some Object Whose Name Begins with That Letter

apparent effort, and, working along these lines, an English inventor has developed a typewriter that should take much of the drudgery out of learning to write and spell. The machine has a circular keyboard showing the letters of the alphabet. When one of the keys is pressed the letter is printed on a slip of paper and beside the letter a small picture of some common object whose name begins with the letter printed. The machine is designed to use interchangeable signs, so that progressive lessons in reading and spelling may be given.

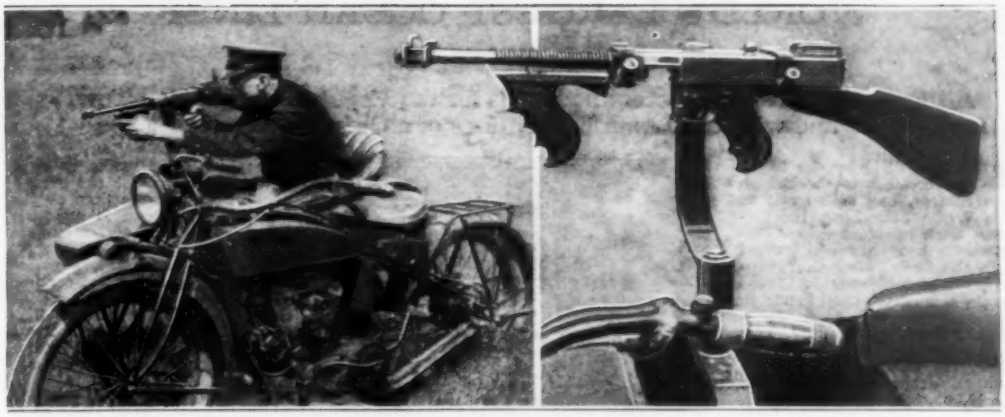
## HOSPITAL GARMENT IS MADE TO BE EASILY REMOVED

To overcome the annoyance and pain occasioned when bedridden patients must be moved or examined, a garment has been devised which can easily be removed without disturbing the patient in the least. The back and front of the garment are made in two parts held together with snap fasteners, and the sleeves are also fastened in the same way. If the garment is made in the form of pajamas, the legs are held in the same manner. Garments made in this form permit ready access when examinations are to be made or wounds dressed. Also, in case one arm or leg of the garment becomes soiled, it can be detached and sent to the laundry separately.

## MINIATURE UPRIGHT PIANO WITH PEDAL KEYBOARD

While the hands are busy with a violin, or other musical instrument, the feet are free to operate a miniature piano designed for that purpose by an inventor in Omaha, Neb. The little piano, weighing only about 30 lb., is 34 in. high, 24 in. wide, and 3 in. thick, with a keyboard, including its 18 pedals, 14 in. wide. Of the 18 notes, nine are treble and nine bass, and it has an arrangement by which these can be played in nine different keys. It can be played by the hands as well as the feet, and it is said that it will perform any ordinary music. It has a harp-like tone, and is easily mastered.

Miniature Piano Played by the Feet, While the Hands Are Free to Perform on Any Other Instrument



**The Thompson Submachine Gun Mounted on a Motorcycle Sidecar Provides an Effective Means of Fighting Automobile Bandits. The View at the Right Shows the Substantial Mounting of the Gun on the Frame of the Sidecar**

# AN ANTIBANDIT GUN IN DEMONSTRATION

By ERIC A. DIME

THAT the Thompson submachine gun is an effective weapon against automobile bandits was demonstrated at the Sportsman's Service Station, Tenafly, N. J., on the 10th of last month. The gun, which was first described in the November, 1920, number of Popular Mechanics, is the lightest automatic gun in existence. It weighs only 9½ lb. and can fire .45-caliber bullets at the rate of 1,000 per minute. It can also be used as a single-shot rifle.

The reason why bandits, after committing a holdup or a robbery, are able to escape in automobiles lies in the fact that a police officer equipped with only a regulation pistol and in pursuit of the crooks, finds it difficult to shoot straight and "wing" the bandits. During the demonstration at Tenafly the submachine gun showed its effectiveness. The weapon was mounted on a motorcycle sidecar and operated by a policeman. The motorcycle pursued an automobile containing dummies representing thugs attempting to make a get-away. The auto was towed by another car some 25 or 30 ft. ahead. The submachine-gun operator opened fire on the "bandits'" car, and shot its tires full of holes, so that the machine had to come to a halt. As a matter of fact, the rapid fire would have killed any one sitting in the automobile.

Later it was demonstrated what this antibandit gun can really do to a motor car when the latter becomes the target of automatic firing. Three of these weapons blazed away simultaneously on a seven-passenger touring car, and in less than a minute reduced the car to a pile of junk. The tonneau was perforated till it looked like a Swiss cheese, the radiator was torn to shreds, the gas tank resembled a nutmeg grater, and the steering gear was turned into an indescribable mass of kindling wood and twisted metal. An incendiary bullet was finally fired into the spilled gasoline, and instantly the machine was a mass of flames.

In densely populated districts, birdshot cartridges are used with the gun. The birdshot afford severe punishment without causing mortality. A 4 by 5-ft. target at which automatic fire of birdshot was directed for five or six seconds was peppered so full of holes that it looked like the face of a man having suffered from a severe case of smallpox. The firing was done at a range of 30 ft., and there was not a spot on the entire target big enough for the smallest mouse to escape death or injury.

The gun will fire a magazine of 20 cartridges containing 120 No. 8 birdshot in 1⅝ seconds, or 2,400 birdshot in a "burst" of 20 shots. No more than 20 birdshot cartridges are placed in a magazine, so it requires four minutes to shoot 1,000 birdshot cartridges containing 120,000 birdshot. There is no other gun in the world that shoots both ball and birdshot cartridges. With ball cartridges, a policeman can fire 42 shots at six bandits armed with automatics containing seven shots each and, shot for shot, have 58 shots without reloading when the automatics are empty. The gun has an accurate range of 2,000 ft. when military high-power cartridges, such as are employed in wars, are used, and with police ammunition, the accurate range is 1,500 feet.

# WORLD'S LARGEST OCEAN LINER

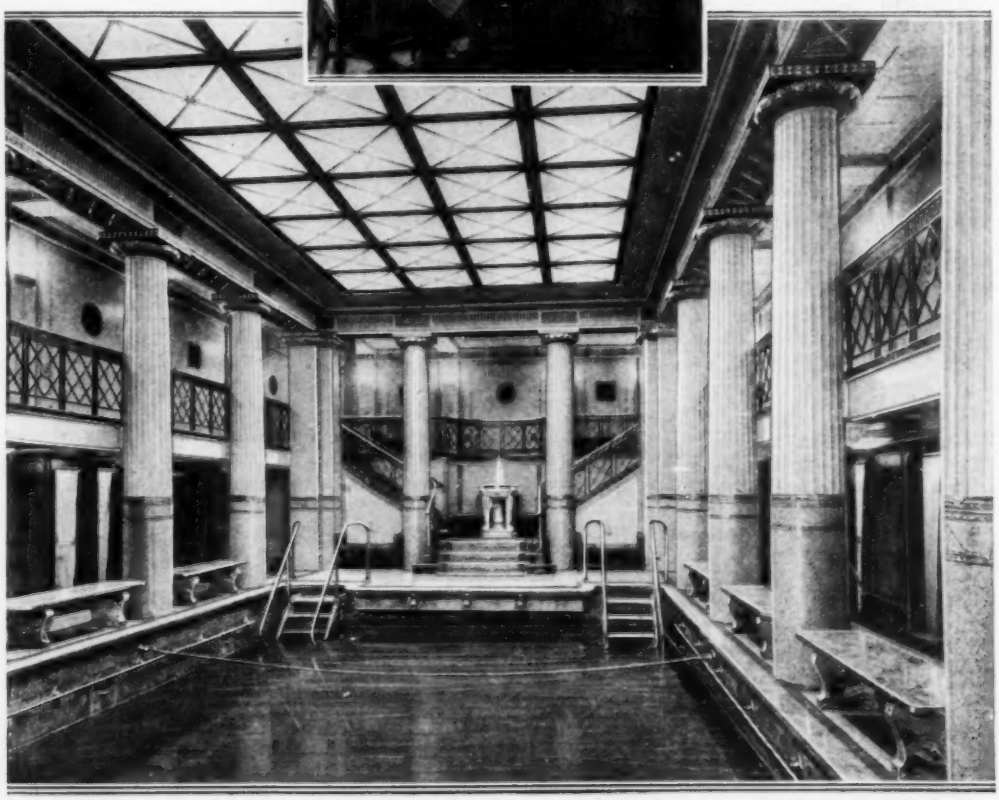
By HENRY S. WHITE

## A Floating Edifice with Accommodations for the Population of a Small Town, and with the Luxurious Fittings of a Great City Hotel

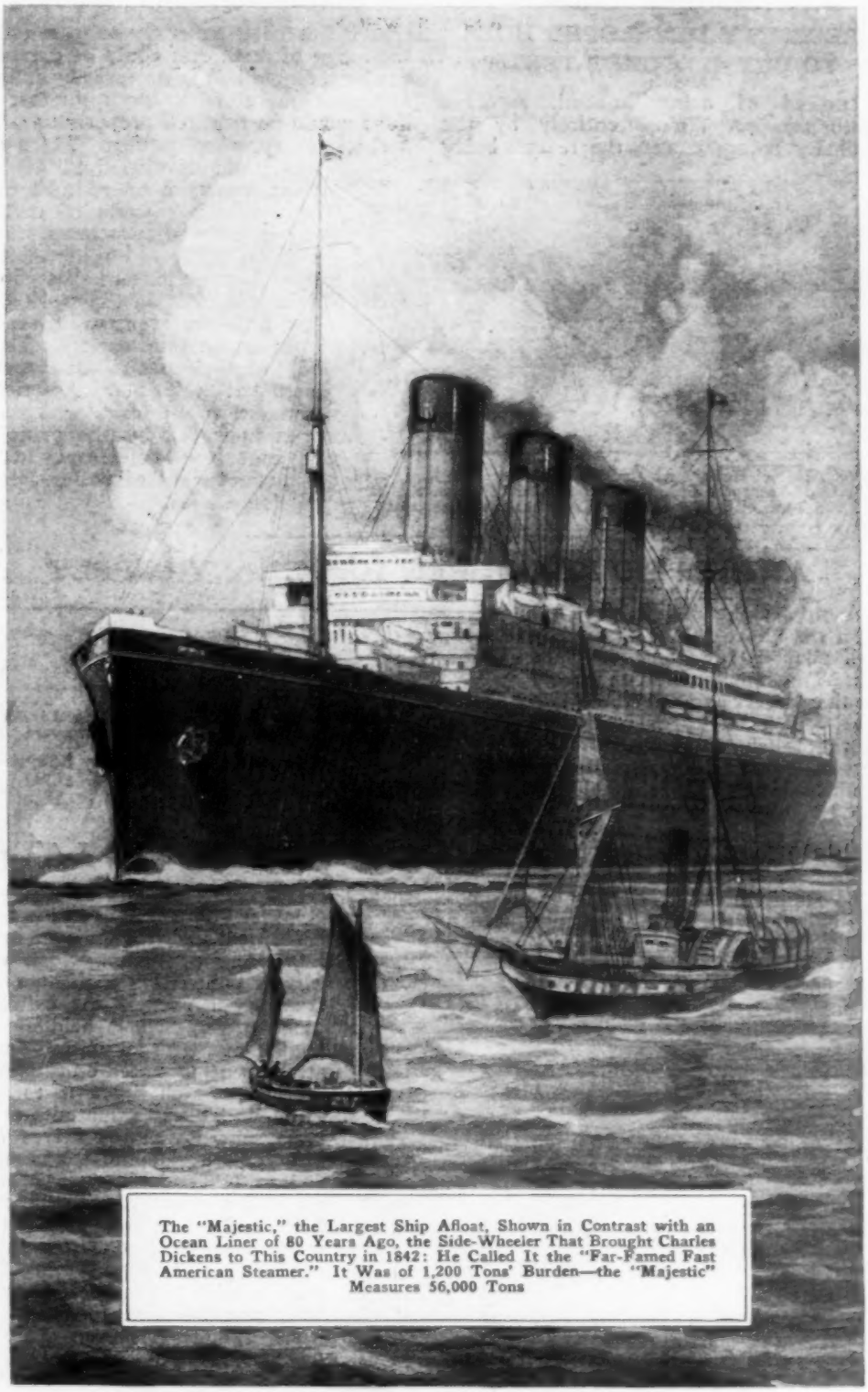
ALLOCATED by the treaty of Versailles to the British government, and sold by it to the White Star Line, the former German steamship "Bismarck" has been converted into the liner "Majestic," very suitably named, for it is the world's largest ship, and in many ways the most luxuriously fitted vessel afloat. This ocean-borne palace is 956 ft. long, 100 ft. broad, its hull is 102 ft. deep, and its tonnage is 56,000. It has nine decks, with a total area of 7½ acres, and its main deck is 75 ft. above water. It has accommodations for 4,100 passengers and a crew of 1,000. Its power installation is the largest ever fitted in a passenger vessel, consisting of four huge turbine engines, each weighing 375 tons, for forward driving, and four reversing turbines. With 48 boilers, it is fitted with a modern oil-burning system, and consumes about 5,700 tons of liquid fuel in a single crossing. The total horsepower is 100,000, and its normal speed is 28 miles an hour. Passengers can take their daily walks in any kind of weather, for the promenade deck is more than 50 ft. above the sea, and is inclosed for a great part of its length with glass panels. On this deck are a restaurant, a palm court, and a lounge. From a grand foyer is an unbroken sweep of 250 ft. down the center of these apartments. Provision is made for outdoor sports in a special section of the boat deck.

Two public rooms of special interest, by reason of their size and location, are the library and the smoking room. Contrary to custom, both are situated at the forward end of the passenger decks, one above the other. The library, on the same deck as the lounge, has shelf capacity for 4,000 volumes. The room affords facilities for personal correspondence, or any kind of literary work.

Besides the luxuriously furnished first-class accommodations, the ship has second and third-class quarters which correspond in character with the other parts of the ship.



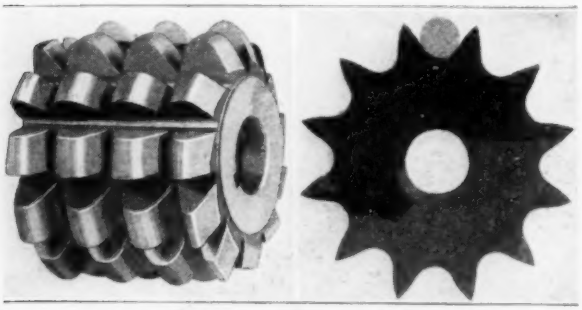
Swimming Pool with an Area of 820 Square Feet: There Are 30 Dressing Rooms and a Gallery for 300 Spectators; Turkish and Electric-Ray Baths Adjoin the Pool. Above is Shown the Dining Room with a Domed Ceiling, 31 Feet High, the Loftiest Apartment Ever Constructed in a Ship. It Seats 652 People



The "Majestic," the Largest Ship Afloat, Shown in Contrast with an Ocean Liner of 80 Years Ago, the Side-Wheeler That Brought Charles Dickens to This Country in 1842: He Called It the "Far-Famed Fast American Steamer." It Was of 1,200 Tons' Burden—the "Majestic" Measures 56,000 Tons

## RECENTLY DEVELOPED HOBS TO CUT SPROCKET TEETH

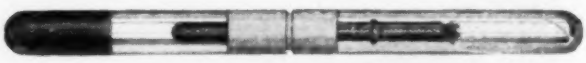
Instead of being hobbed, sprocket teeth are cut almost entirely by the ordinary rotary cutter, the reason being that it has been generally supposed that the range of teeth that could be correctly cut by a single hob is necessarily limited, and that therefore a large number of hobs would be required properly to equip a shop for sprocket cutting. There has now been developed in an Indiana factory a set of hobs, each of which is capable of cutting any number of sprocket teeth of a given pitch and roller diameter. A single one of these hobs, it is said, will do the work that has hitherto required a set of from six to nine cutters. These hobs are designed to cut sprocket teeth of the new American-standard tooth form, which has been approved by the principal engineering societies, and by manufacturers of roller-transmission chains.



Left: A Set of Hobs, Each Capable of Cutting Any Number of Sprocket Teeth of a Given Pitch and Roller Diameter. Right: The Form of Sprocket Tooth Which has been Approved

## ANTISEPTIC IODINE PEN HAS READY SUPPLY

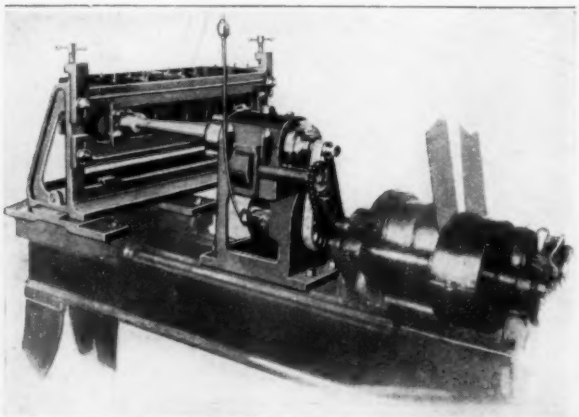
A nonleaking iodine pen has been developed which is equally well adapted for home or office use. The supply of iodine is held in the lower part of the glass tube, and is fed through a valve to the brush, as required. The flow of iodine can be regulated by partially opening or closing the hole in the glass pen. The end of the brush may be cut off after using if desired.



The Supply of Iodine is Held in the Glass Reservoir and is Forced into the Brush by Pressing the Glass Pen Downward

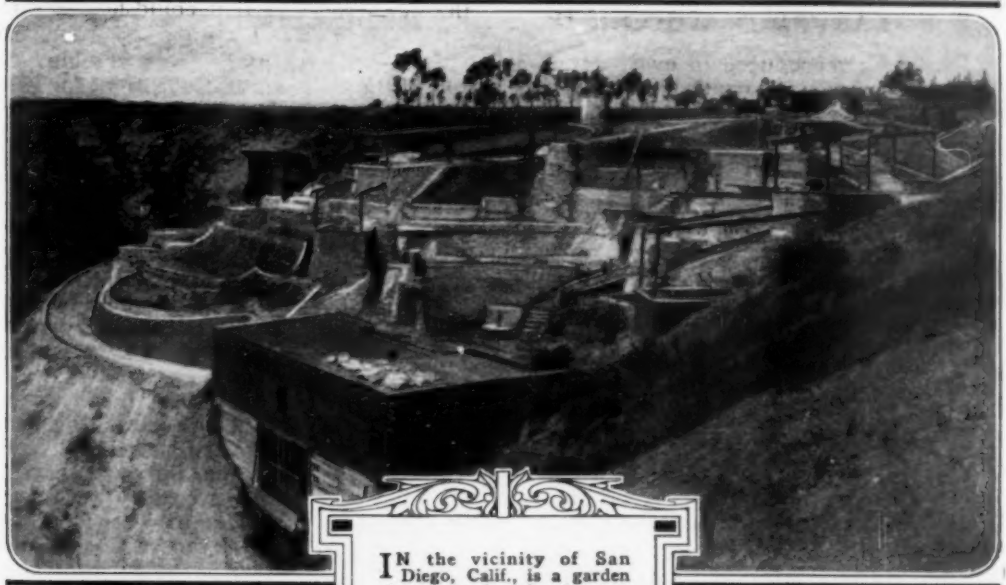
## CYLINDER-GRINDING MACHINE ATTACHES TO LATHE

To facilitate the regrinding of automobile cylinders there has been produced a special attachment for lathes of 14-in. swing and larger. The attachment is self-contained, and has its own driving motor of ½ hp. which will run by connection with an ordinary lamp socket. A cylinder block of any size is held on an angle plate, with an up-and-down attachment, mounted on the lathe carriage, which feeds it to the grinder. This is mounted on the lathe, and its motor drives the grinding-wheel spindle, and also at its other end, through sprockets and a silent chain, the carriage-feed gearing. Thus the whole machine is operated independently of any power in connection with the lathe. Different feeds are provided for, and the wheel spindle is driven at 5,600 revolutions per minute. The attachment weighs about 500 pounds.

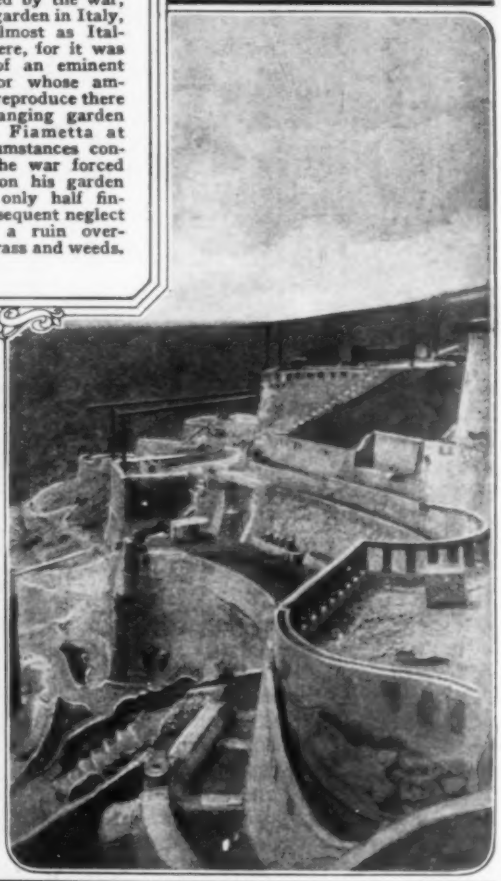


Cylinder-Grinding Attachment for Lathes: It is Operated by Its Own Motor Which Drives the Grinder and Also the Feed Gearing of the Lathe Carriage on Which the Cylinders are Mounted. The Attachment Weighs About 500 Pounds

# AN ITALIAN GARDEN MADE IN AMERICA

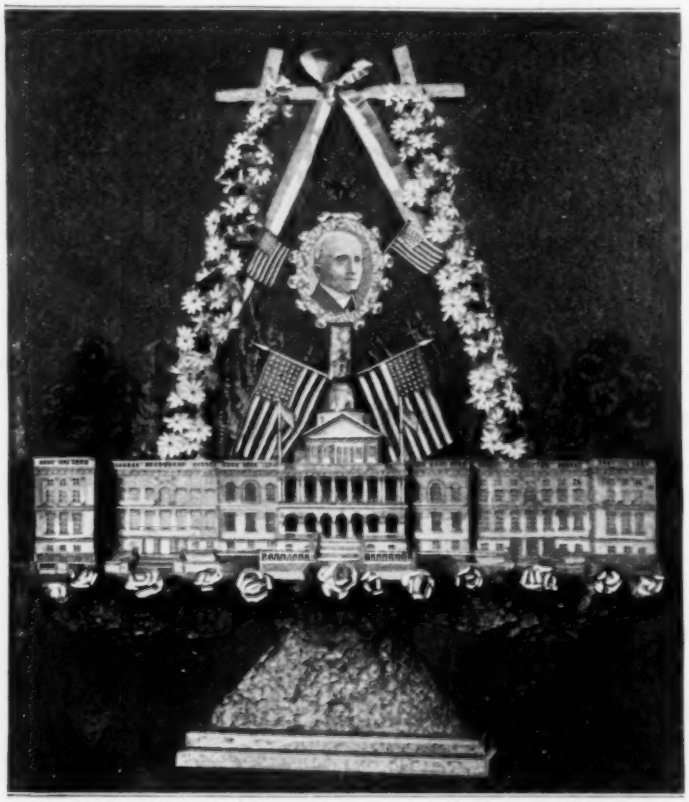


IN the vicinity of San Diego, Calif., is a garden that was ruined by the war, like many a garden in Italy, and that is almost as Italian as they were, for it was the product of an eminent Italian sculptor whose ambition was to reproduce there the famous hanging garden in the Villa Fiametta at Naples. Circumstances connected with the war forced him to abandon his garden when it was only half finished, and subsequent neglect has made it a ruin overgrown with grass and weeds.



## STATE CAPITOL BUILDING CARVED IN WOOD

Faithfully reproduced in every detail, a replica of the state capitol building has been carved in wood and presented to former Governor McCall of Massachusetts. The work is supported by a pedestal of carved wood, and is surmounted by a frame of wooden daisies.



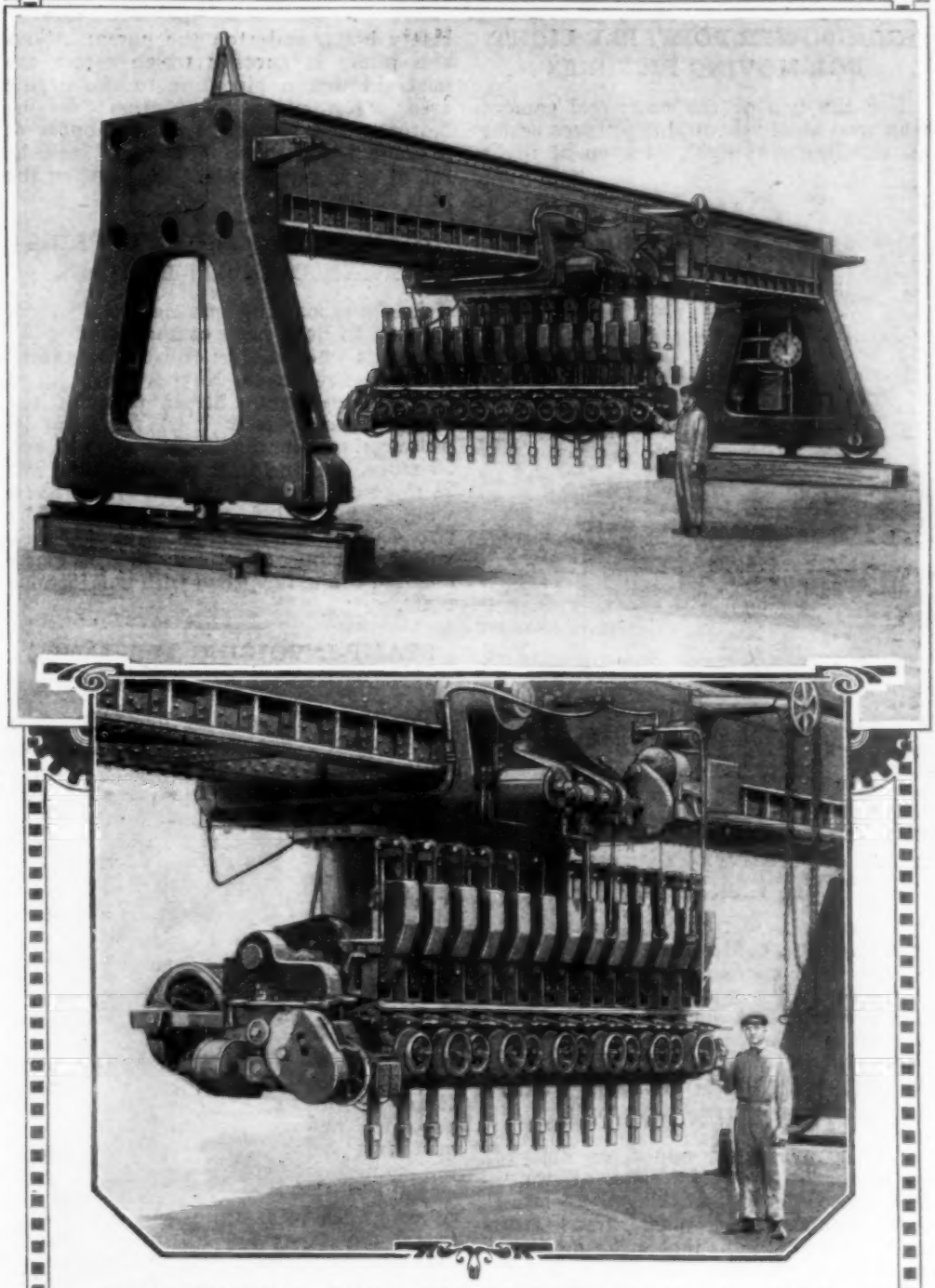
Replica of the State Capitol Building Presented to Ex-Governor McCall of Massachusetts: Carved Entirely Out of Wood, It Stands Four Feet High. Above the Dome Is a Framed Photograph of the Ex-Governor

## MUD IS VALUABLE ACCESSORY IN DRILLING OIL WELLS

Mud—ordinary mud—is as precious as gold in the oil fields of California, for this gray substance is found in the Montebello oil fields and scarcely anywhere else in the state. So valuable is it that it can be neither bought nor sold, but is rented on condition that it be returned the moment its mission is fulfilled. This peculiar mud is almost indispensable in drilling for oil. At first, it is used as a primer to start the rotary drill; then, as the drill penetrates the earth, it is necessary to force the mud into the hole between the drill and the walls in order that the latter may not cave in. The mud must not be permitted to harden and clog operations, and so it is kept in circulation. To accomplish this, it is drawn from the hole and sluiced into a vessel or box and allowed to settle. The top, or lighter, mud is then forced back into the hole. Seeing it in trucks being transported to other fields, one would marvel at the careful handling of it. Never a lump is lost. If any falls from the truck, the team is halted and the pieces carefully gathered up and replaced in the truck. Renting this mud has proved a profitable business to the man upon whose land it is found.

## TRAVELING MULTIPLE DRILL FOR PLATES

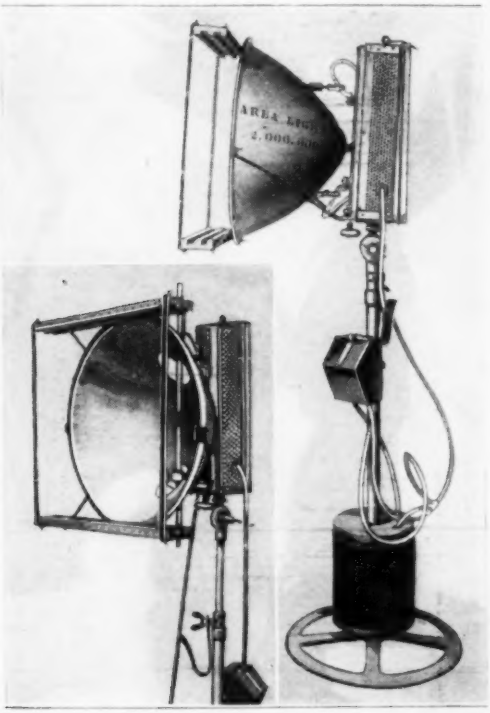
A multiple drilling machine, of exceptionally large proportions, for drilling, countersinking, and tapping steel plates has been constructed in New York. The multiple drills, 13 in number, are mounted on a cross-rail casting that is suspended from two double-webbed plate girders, supported 8 ft. 10 in. above the floor by two heavy cast-iron uprights, each mounted on two wheels running on rails 44 ft. apart. The cross rail is suspended from a wheeled carriage that runs on tracks above the bottom flanges of the girders, and under this carriage the cross rail and its drills are pivoted. A constant-speed reversible motor is provided either for revolving the cross rail and drills, or for driving the wheeled carriage the whole length of the girders. The drill spindles are adjustable, and have a minimum center to center distance of 8 in., the maximum distance between outside spindles being 12 ft. 8 in. The spindles are 2 in. in diameter at the driving point.



Traveling Multiple Drilling Machine with 13 Drill Spindles, and with a Span of 44 Feet between the Rails That It Travels On: Above Is a General View of the Machine, Showing the Revolving Cross Rail at Right Angles to the Supporting Girders. The View Below Shows in Greater Detail the Cross Rail Carrying the Drilling Heads. They are Driven by the 50-Horsepower Motor Seen at the Left

## HIGH-POWER PORTABLE LIGHT FOR MOVING PICTURES

For the use of the news-reel camera man who must "shoot" his pictures under all conditions of light, or even at night



This Lightweight Portable Arc Light, with a Parabolic Reflector, is Designed for Taking Moving Pictures at Night

if the occasion demands, a portable arc light has been constructed which is light enough to be carried by one man. It is equipped with a parabolic reflector and uses a remarkably small amount of current considering the intensity of the light.

## WATER JETS AND PUMPS USED IN TREATMENT OF PEAT

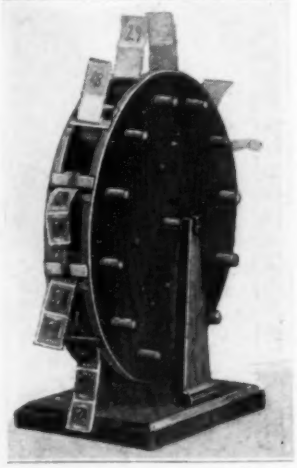
Peat is now being mined, in Finland, by means of powerful jets of water, driven into the bog, working it up into a homogeneous liquid mass, freed from the roots and stumps that make mechanical digging difficult. The liquid is then sucked up by a turbine pump that has cutting blades adjusted to cause minute subdivision of the peat mass. Means are provided to prevent the entrance into the pump of any large solid substance, and if, in spite of this, hard objects are drawn in, they cause the fracture of several safety bolts, and stop the pump. Above this pump is another which forces the peat through a pipe line to the drying area. The pumps with their driving motors are suspended from the boom of a crane mounted on a car, and can be raised or lowered to suit the level of the peat in the bog.

## GIANT FLYING BOAT CARRIES TWENTY-SEVEN PERSONS

A new record for passenger carrying is claimed to have been established for flying boats when the air cruiser "Mendosa" recently flew from Keyport, N. J., to the Eighty-Second Street pier on the Hudson River, New York, carrying 27 passengers. The air distance covered was 30 miles, and the time for the flight was 21 minutes. The "Mendosa," which has a wing spread of 104 ft. and is propelled by two 400-hp. Liberty engines, is equipped with a spacious, electrically lighted, glass-inclosed cabin, furnished with comfortable seats.

## STAMP-INVOICING APPLIANCE FOR RAPID ACCOUNTING

Postage stamps can be invoiced rapidly with a contrivance consisting of a reel incorporating 12 spools, on which stamps of different denominations are wound, after first being numbered on the mucilage side. A glance at these numbers offers a ready indication, at any time, of the amount remaining on the spool, or of the quantity sold. The wheel may be removed from the standards and placed in the vault at night.



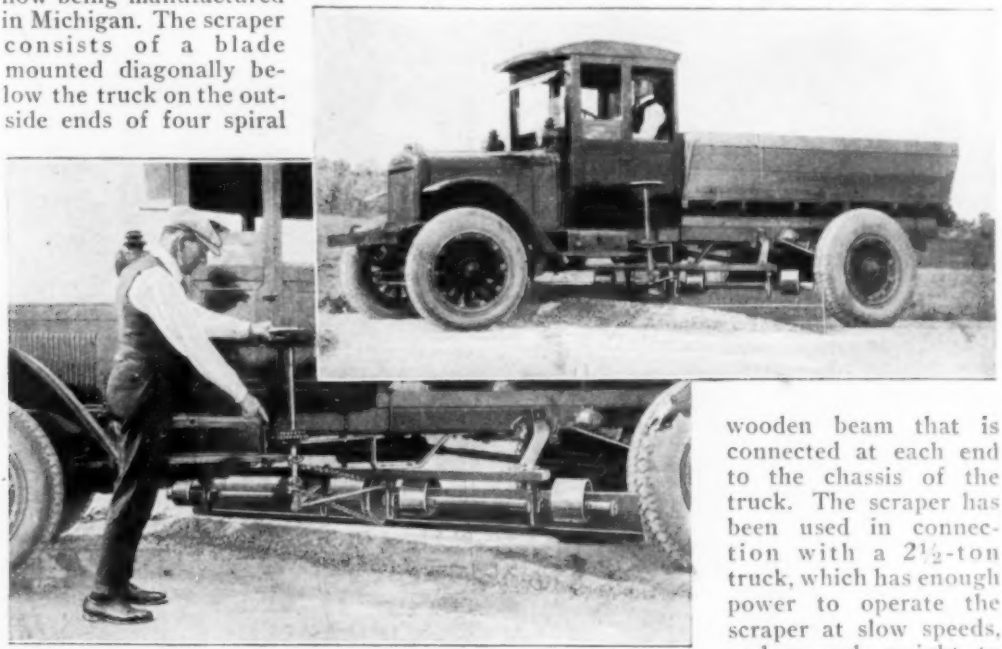
¶A New Zealand steamship company is converting a former hulk into a modern coal-handling plant at a cost of $485,000. The converted hulk will be capable of bunkering steamships at the rate of 120 tons an hour.

SWEDISH LOCOMOTIVES READY FOR DELIVERY TO RUSSIA

AS an indication of the attempt of Soviet Russia to reëstablish her railroads on an operating basis, contracts have been let to Swedish locomotive works for 200 railroad engines to be delivered in 1922 and 250 per year for the three following years. Fourteen of these engines have been completed and are ready for delivery.

## TRUCK FOR ROAD MAINTENANCE HAS SCRAPER ATTACHMENT

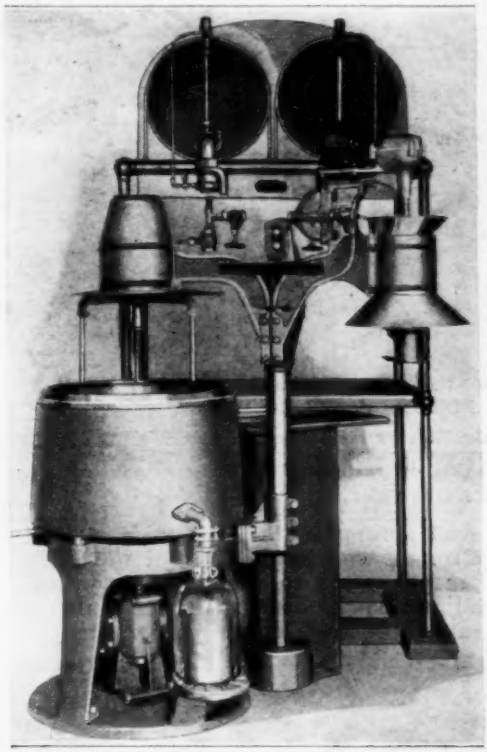
For the maintenance of gravel roads, a truck fitted with a scraper attachment is now being manufactured in Michigan. The scraper consists of a blade mounted diagonally below the truck on the outside ends of four spiral steel springs, each 6 in. wide and very strong. The inside ends of the springs are connected to a hollow bar which is adjustable by means of a chain and ratchet post. The bar is bracketed to a wooden beam that is connected at each end to the chassis of the truck. The scraper has been used in connection with a 2½-ton truck, which has enough power to operate the scraper at slow speeds, and enough weight to hold it down firmly.



Above: Road-Maintenance Truck with Its Scraper Attachment Shown in Operation. Below: Close-Up of the Mechanism for Operating the Scraper

## CENTRIFUGAL MACHINE MAKES COFFEE AND BOTTLES IT

For making coffee in large quantities rapidly a mechanical coffee infuser and bottle filler is now being installed in a

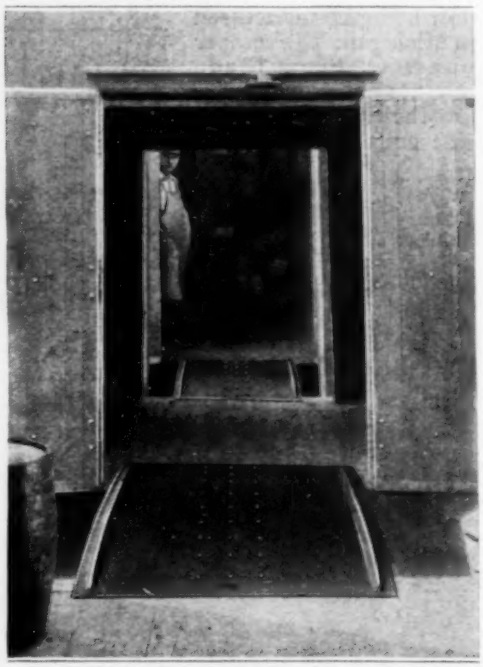


Coffee Infuser and Bottle Filler with the Water Container in Position for Feeding Boiling Water into the Infusing Bowl and Thence into the Bottle

number of restaurants and large hotels. The machine operates centrifugally, somewhat on the same principle as a cream separator. Mounted on a skeleton base is a metal bowl which incloses a basket made of fine wire mesh and lined with filter paper. This basket is rotated at a speed of 1,200 r.p.m. by an electric motor which, with its gear box, is within the base and beneath the bowl. By the side of this is a vertical post which carries above the bowl a two-armed pivoted bracket, with a ground-coffee container at the end of one arm, and a hot-water container at the end of the other. In the coffee container is a stirrer that is revolved at a very high speed by a second small motor, by which means, through a distributing propeller beneath the container, the coffee is thrown against the inside wall of the whirling basket. The machine operates in connection with two boilers above it, from which boiling water is fed into the hot-water container. When the wall of ground coffee has been formed in the basket, the bracket is swung round so that the water container takes the place of the coffee container above the whirling basket, into which the water is fed so that it is forced through the wall of coffee. It then issues through an outlet spout into a bottle-filler tank, from which it is siphoned into bottles. The product is a coffee extract strong enough to make at least four times its quantity of drinking coffee.

## SAFETY TOE BOARD FOR CARS AIDS RAILROAD TRUCKMEN

Trucking freight into or out of railroad box cars has been facilitated by the introduction of a safety toe board which is constructed of $\frac{3}{16}$-in. steel. The board is slightly curved to equalize any difference in elevation between the cars and the loading platform, so that both ends may rest flush on the floor. A flange on each side acts as a guide for the truck wheels, and bosses are provided along the center to insure a safe and sure footing under any conditions which may confront the truckmen, such as rain-soaked or ice-covered platforms.



Safety Toe Board, Showing the Flanged Sides and Metal Bosses Which Prevent Accidents during the Loading or Unloading of Freight

# FLOOD-DEVASTATED TOWN OFFERS STRANGE SIGHTS

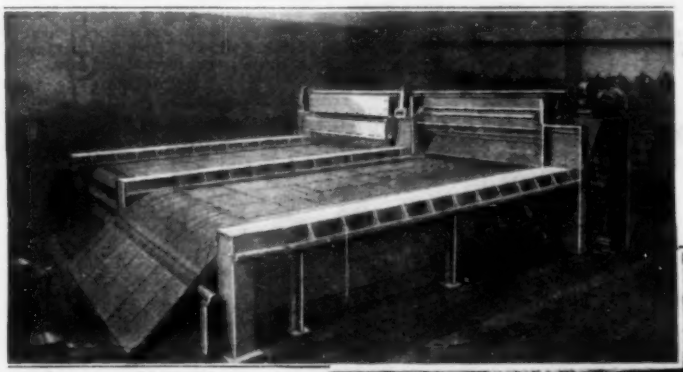
Views of the Recent Flood at Beardstown, Illinois: At the Top is Seen One of the Poster-Carrying Boats Which Were the Only Means of Reaching the Polls on Election Day. In the Center is Shown the Torrent Pouring over a Break in the Levee, through the Tracks of the Chicago, Burlington, and Quincy Railroad. Below, a Funeral is being Conducted under Unusual Circumstances. The Wide Flatboat is Carrying the Casket and Mourners Away from the Church Seen at the Left, on Their Journey to the Distant Burial Ground

**TRAIN WRECK IN INDIA THE RESULT OF A PLOT**

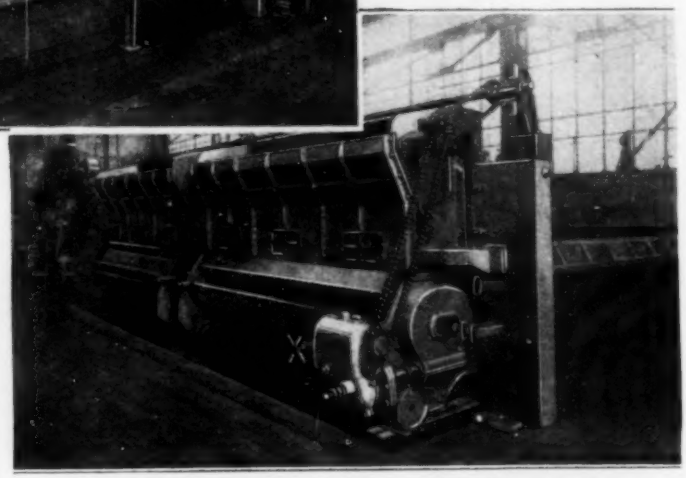
A TRAIN was wrecked recently while traveling at a speed of 50 miles an hour near Madhupur, India, on one of the great trunk-railway lines. The wreck was the result of a fiendish plot, the object of which was to wreck both the up and down mail trains, which usually pass each other at this point. After removing the fish-plates, a loose rail had been laid across the track, with the result that the locomotive and six cars were hurled down the 50-ft. embankment. Six people were killed and many more were injured.

## AUXILIARY GRATE FOR BURNING LOW-GRADE COAL

As the available areas of high-grade coal are mined out, the problem of burning the lower-grade coals and lignites becomes more urgent and is leading to experiments that will eventually find the solution. It has been found that the lower-grade coals can be burned successfully if a strong base, or starting, fire is maintained, and to accomplish this automatically, an auxiliary fire grate has been evolved for use in combination with a movable chain grate. The auxiliary grate is driven from the main grate and pushes the partly ignited coal forward upon the strongly burning fire which is carried forward by the chain grate. Arrangements are also made to conduct a draft of air under and through this auxiliary fire grate if necessary, to insure dehydration and complete combustion.



**Rear View of the Special Grate for Burning Low-Grade Fuel**



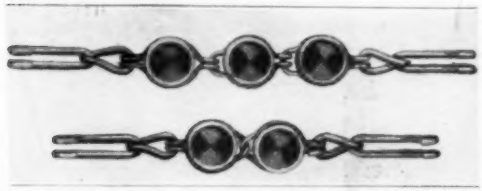
**Front View of the Grate Setting: The Fuel is Fed into the Hopper and Drops onto the Auxiliary Grate Which is Driven by Chains**

## EXPEDITION FOR SALVAGING HULL OF THE "LUSITANIA"

It is reported that a salvaging company in Philadelphia is about to send an expedition for the purpose of attempting to raise the "Lusitania," and other vessels that have been wrecked during the last few years. In the case of the "Lusitania," much doubt is expressed, in England, as to the possibility of success. It is pointed out that this huge vessel, of such enormous weight, lies under 360 ft. of water. This means that the hull has been subjected to a pressure of 155 lb. per square inch for about seven years, and that now the hull may be disintegrated.

## AUTOMOBILE-TIRE CHAINS WITH VACUUM CUPS

An automobile-tire chain, recently patented, is designed to give an extra-strong grip upon the surface of the roadway without sacrificing its strength and wearing quality, and also to eliminate the necessity for the circumferential side chains common to such devices. These are replaced by flat, close-fitting members similarly located on the sides of the tire,



**Cross Chains for Automobile Tires: Two or Three Links on the Tire Tread Have Each a Vacuum Cup That Grips Firmly and Resists Wear**

but made of a flexible fibrous material. Around their outer circumferences are a number of eyelets in which are clamped the end hooks of the cross chains. These are formed of two or three steel links, each carrying a flat vacuum cup which may be of hardened metal or of tough fiber, best suited to withstand gripping and grinding wear, independently of the tensile strains which are taken care of by the parts of the links that hold the cups.

## NOW USE NONEXPLOSIVE GAS TO FILL TOY BALLOONS

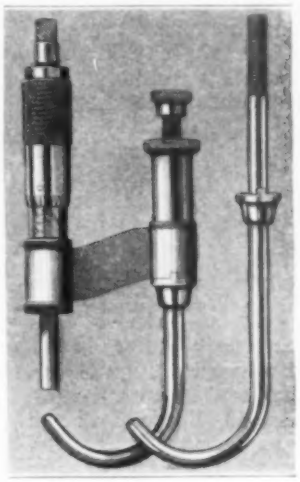
An unexpected development following the discovery of a nonexplosive balloon gas is the use of this gas for filling toy balloons in place of the more dangerous hydrogen gas. Some cities have already passed laws prohibiting the sale of hydrogen-gas toy balloons because of the danger of fires, but there should be no objection to balloons filled with the new

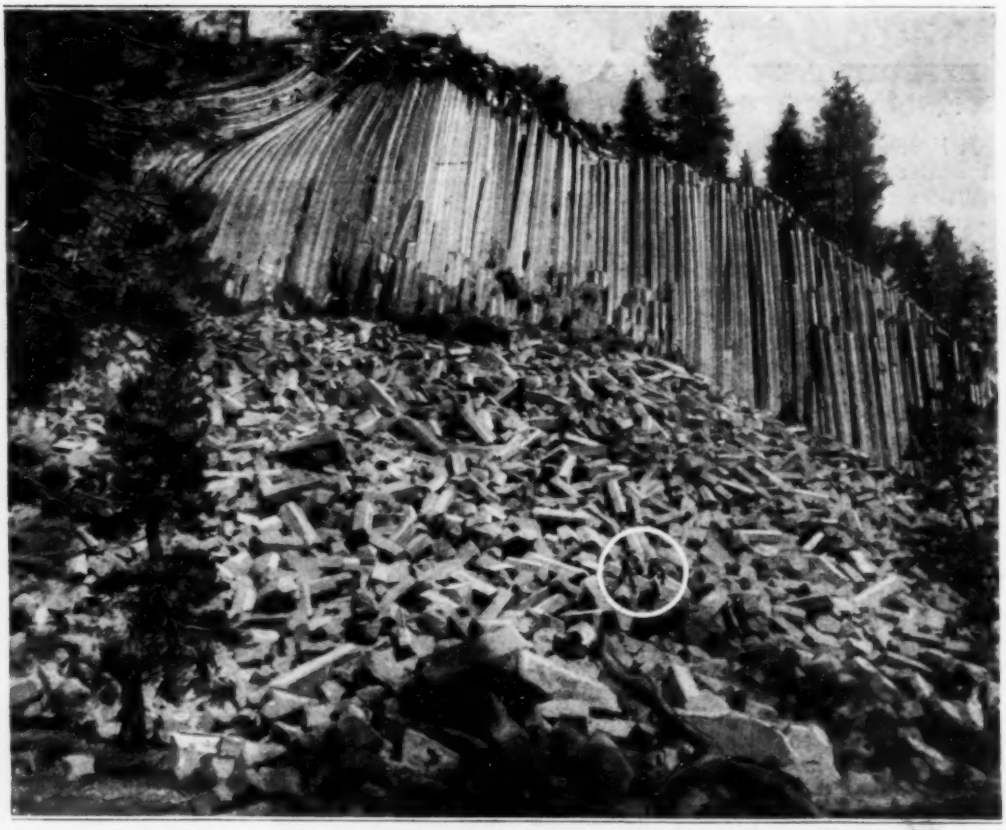
**Left: Street Vender — with Conspicuous Cigarette — Selling Noninflammable Gas Balloons. Right: Showing How the Escaping Gas Blows Out a Candle Flame**

gas. Tests have shown that if a lighted candle is permitted to burn through the envelope, the escaping gas will extinguish it.

## MICROMETER CALIPER GAUGE USEFUL FOR INSPECTORS

Measuring the walls of hollow cylindrical forms accurately is often an awkward and difficult job, and a micrometer caliper gauge has recently been marketed that will make this easy, and will be particularly handy for inspectors. The gauge is furnished with two anvils, and by means of a micrometer attachment measures by thousandths of an inch up to 2 in. With this gauge it is said to be as easy to measure cylindrical walls as flat material. It can also be done as rapidly.



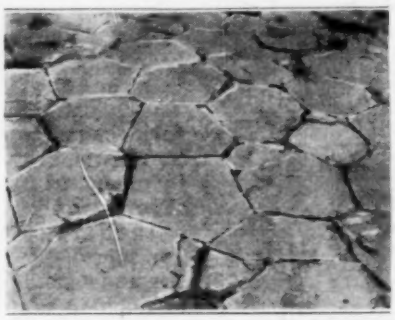


An Unusual Cliff of Columnar Basalt, Found in the Sierra Nevada Mountains: The Broken Pieces in the Foreground have Fallen Away from the Cliff. Note the Relative Size of the Men Shown in the White Circle

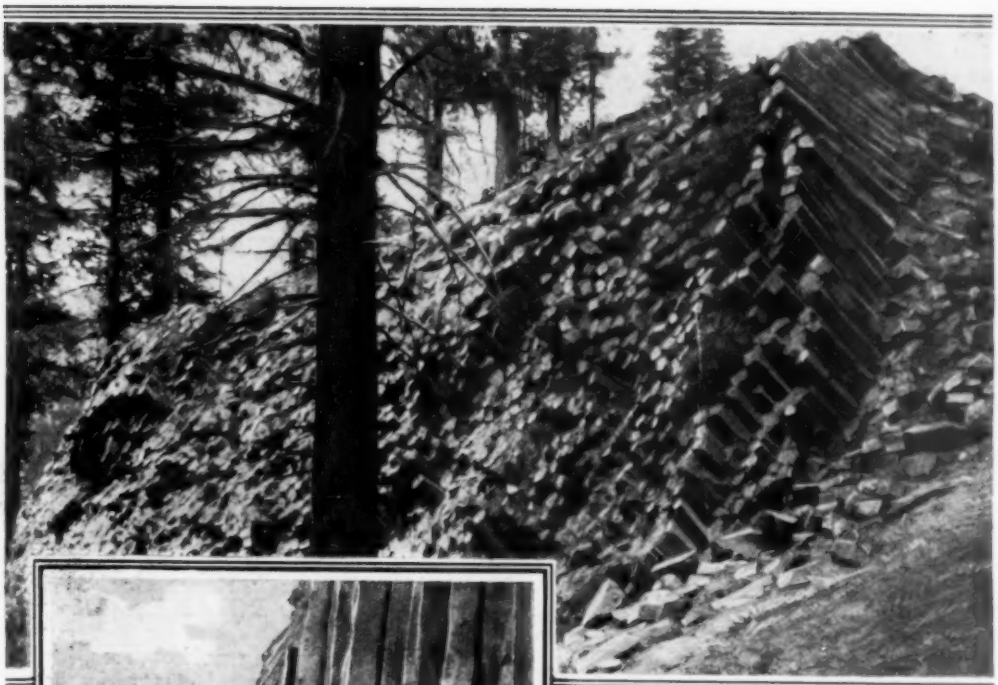
# THE DEVIL'S POSTPILE

By JOHN L. VON BLON

THOUGH set apart by the president a decade ago, recognized as the best example extant of its peculiar type of columnar basalt, and readily accessible in summer, "The Devil's Postpile" remains virtually unknown and unseen. Perhaps only one out of every 10,000 Americans has beheld it or could tell its location, while foreign governments and institutions send their scientists to study the splendid tower of long, dark, glistening prisms. This natural wonder is located in the high Sierra Nevada Mountains, on the middle fork of the San Joaquin River, and is within easy driving distance of Los Angeles or San Francisco. The "pile" is a mile long, half as wide, and 400 ft. high. The odd formation whence its appellation is derived is not everywhere in evidence, cropping out only in certain places. The most striking columns constitute more than 1,000 ft. of its western face. They rise over 100 ft. above the talus—a vast heap of broken "posts" accumulated through the process of weathering. How far downward they extend is a matter of conjecture. The columns in this amazing bluff are arranged in rows as regularly as the pipes of an organ. Almost perfect prisms, they are fitted together like cells in a honeycomb, and really look as if carved by human hands. These columns range from 14 in. to more than 3 ft. in diameter. Most of them are pentagonal, whereas elsewhere the general

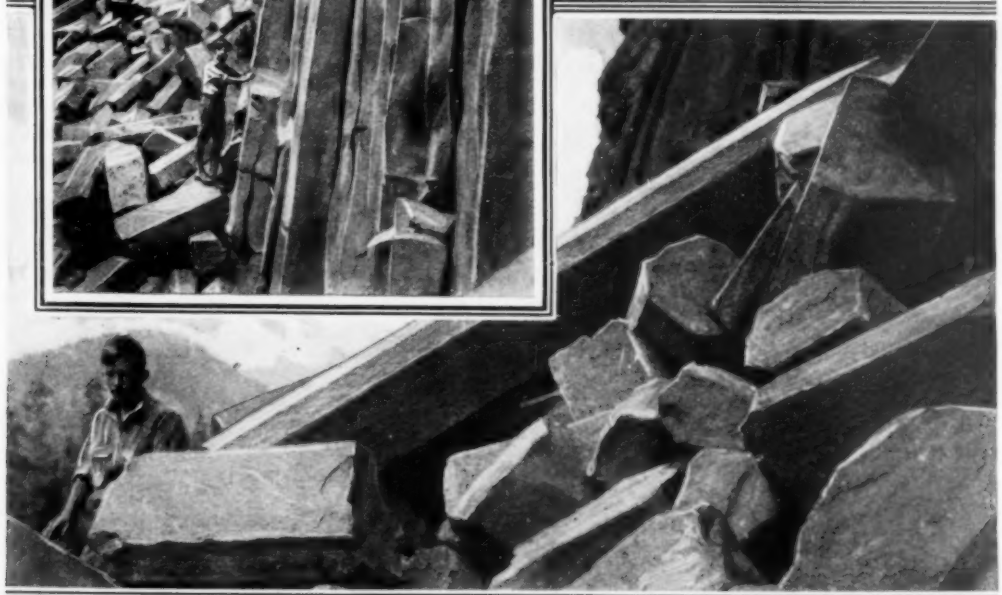


Looking Down on the Upper Ends of the Columns Which are Polished Smooth and Give the Appearance of a Giant Mosaic Floor



Above: On the Far Side of the Cliff the Formation has been Bent Over, Until the Columns, Instead of Standing Vertically, Are Nearly Horizontal and Resemble a Giant Wood Pile. They Glisten in the Sun with Almost the Brilliance of Precious Stones

Left: Giving Some Idea of the Prismatic Formation of the Columns. The Man at the Base of the Columns Is Six Feet Tall



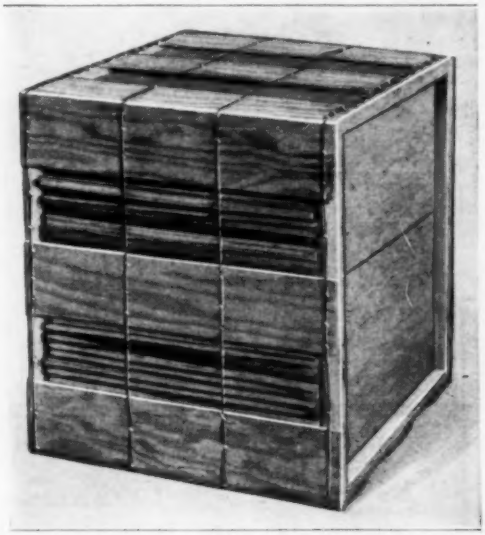
A Section of the Fallen Column Which Stood Alone for Many Years but was Struck by Lightning and Fell: This can be Seen Standing Almost in the Center of the Picture on the Opposite Page, and Was One of the Finest Specimens of This Peculiar Formation

shape is hexagonal. The Devil's Postpile affords strange deviation in this respect, some of its immense columns being eight-sided, many seven-sided, and the remainder hexagons. In one extensive section they are straight as sawed timbers and perpendicular. In another they lean and are gracefully curved, and the individual prisms are twisted and fluted, resembling sticks of pliable candy. At one point they have the wavy appearance of flowing water. At the southern, upper end they project almost horizontally and resemble gigantic railroad ties or evenly corded wood on a hillside.

For many years the handsomest of all the columns, tall and symmetrically tapered, was separated from the body and stood upright and alone, but unfortunately, it was recently struck by lightning.

## NEW PACKAGE REDUCES LOSS IN SHIPPING SHINGLES

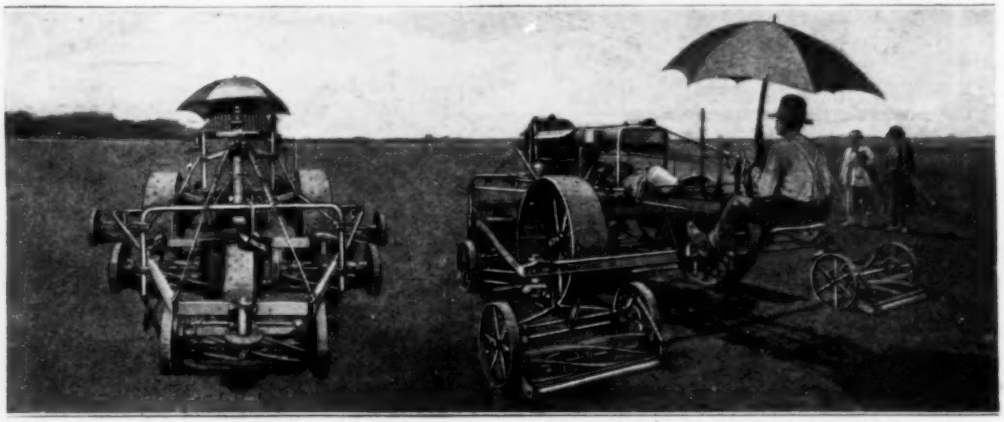
That the older method of packing shingles for shipment resulted in much damage and loss, has led to the development of a new container for use particularly in export shipments. The new package has box ends and corners and is bound by strapping or wire. Each case contains 500 shingles and can be handled with hooks without damage.



This Packing Case for Shingles Has Box Ends and Corners to Reduce Loss from Breakage

## MOTOR-DRIVEN GRASS MOWER CUTS AND ROLLS LAWN

Mowing and rolling golf courses, lawns of large estates, parks, cemeteries, etc., may be accomplished efficiently with a motor-driven mower produced by an Illinois manufacturer. The outfit possesses a powerful six-cylinder engine which draws five 30-in. cutting units attached to a triangular floating frame, each unit arranged so as to overlap another, the whole cutting a swath 11½ ft. in width. A two-ton roller can also be added to the machine without affecting the operation or maneuvering. The mowing attachment may be removed in a few minutes, so that the implement can be utilized for pulling wagons for field or road uses, or equipped with a belt pulley for pumping or other stationary power work.



The Front View of the Motor-Driven Mower, at the Left, Shows the Triangular Arrangement of the Five Cutting Units on the Floating Frame. At the Right Is a Rear View Which Reveals the Extreme Length of the Steering and Control Apparatus

"Water-Gun" Machine, Showing the High-Pressure Nozzles, Mounted on the Top: Two of the Four Connections, Capable of Taking Three Lines of Hose Each, can be Seen Projecting over the Side

## "WATER-GUN" MACHINE TAKES TWELVE LINES OF HOSE

Taking the water from 12 lines of hose simultaneously and throwing it in two concentrated streams at extremely high pressure, is possible with a new "water-gun" machine recently added to the Boston Fire Department. Various nozzles are used in conjunction with this apparatus, measuring from 1½ to 2½ in. in diameter, depending upon the pressure or height of stream desired. The pressure per square inch at the nozzles ranges from 200 to 300 lb., and the machine has a total capacity of delivering 1,850 gal. of water per minute.

## DIRECTIONAL-RADIO SERVICE OF SHORT WAVE LENGTH

Directional wireless, the absolute contrast of the methods now employed wherein anyone possessing a receiving set that is tuned to the proper wave length can "listen in," is being rapidly developed. By recent experiments, according to Signor Marconi, it has been demonstrated that 20-meter wave lengths are capable of providing point-to-point directional commercial service over very wide ranges. Service of this nature would be considered comparatively secret, in comparison with the broadcasting type of radio transmission which is at present so much in vogue in this country as a means of furnishing both entertainment and valuable instruction in the home.

## ELECTRIC-BATTERY OPENER SIMPLE AND PRACTICAL

Opening batteries with the aid of an electric-heating appliance is the principal feature of an accessory now being manufactured by a Minnesota company. The outfit consists of an insulated metal box, 26 by 15 by 14 in. in size, in which the batteries are placed, and the compound softened by the radiation from heating elements. By this method, the electrolyte is never diluted with water, as is common with various steam openers, and acid-saturated cases can be thoroughly dried for reassembling and painting.

Electric-Battery Opener with the Cover Raised, Showing How the Heating Element is Fastened to the Lid of the Appliance

## SPEEDY ELECTRIC FOLDER FOR PRINTING SHOPS

Parallel folds at the rate of 10,000 to 20,000 per hour are possible with the use

Electric Folding Machine Which Makes One or Two Parallel Folds at One Feeding and cannot be Fed Out of Time

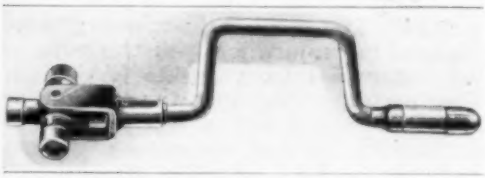
of an electric folding machine now being distributed by a Chicago sales company. The mechanism is tapeless, and by the simple shifting of a gauge and the adjustment of thumbscrews, various sizes of standard and accordion folds are produced. The rolls are of solid steel, turned and knurled to absolute accuracy, are driven by machine-cut gears, and mounted in oilless spring-cushioned bearings in a heavy, double-ribbed gray-iron frame.

## LATEST TUNGSTEN ARC LAMP HAS ONE-POINT LIGHT

Tungsten arc lamps, particularly adapted for projection, microscopy, and general laboratory uses, are now being manufactured and placed on the market by an Eindhoven, Holland, concern. These new lamps are so constructed that they give virtually a one-point source of light, by means of an arc discharge which takes place between two small tungsten spheres placed in an atmosphere of rare gas. The distance between the spheres and the glass walls of the lamp may be very small, so that a short-focus condensing lens can be employed when the lamp is wanted for projection purposes.

## AUTOMOBILE-RIM WRENCH HAS SOCKETS OF FOUR SIZES

For use on rims of automobiles, a wrench with a quadruple revolving socket head of four different sizes, is now on the market. It is equivalent to four ordinary wrenches, for in order to change the size of the socket all that is necessary is to give the socket head a quarter turn, when the handle and socket become locked securely, and the wrench is ready

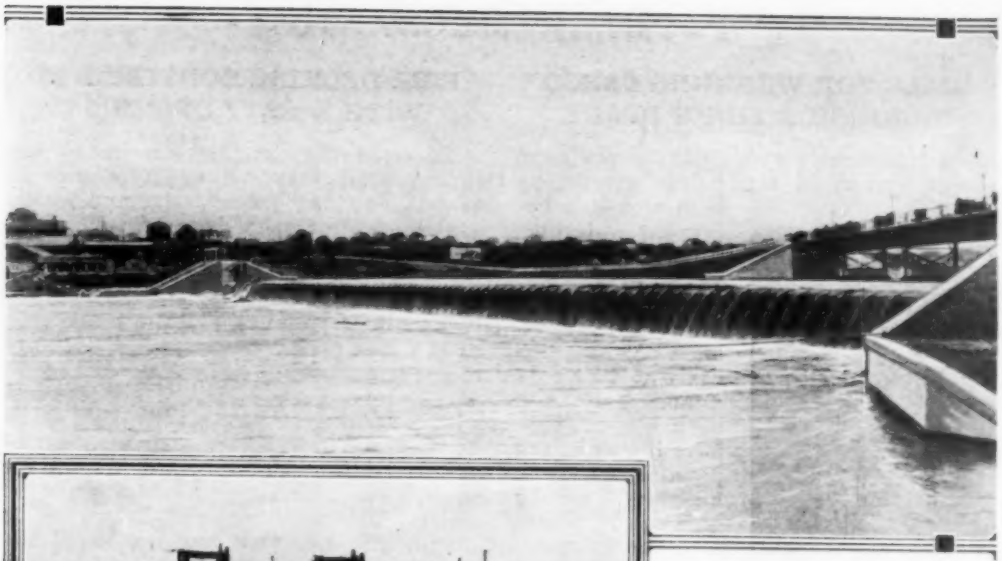


Automobile-Rim Wrench with a Revolving Socket Head That Has Sockets of Four Different Sizes

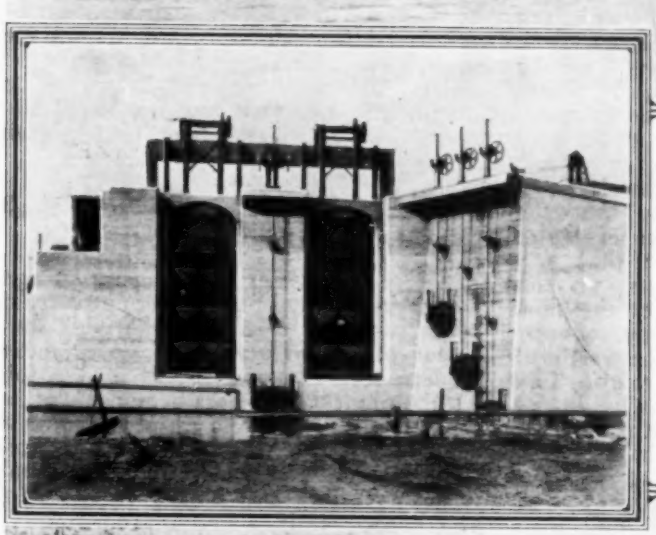
for use with any one of the four different-sized sockets.

## WATER-IMPOUNDING PROJECT OF VAST PROPORTIONS

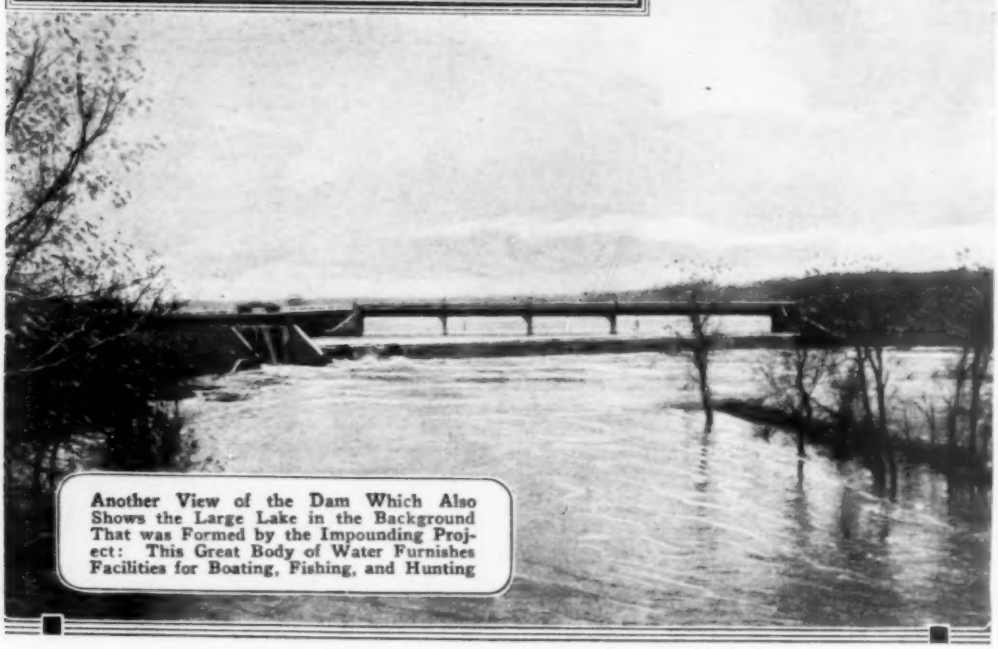
Industrial expansion was responsible for the launching of a vast water-impounding project at Decatur, Ill., two years ago, which undertaking has been completed but recently. Engineers had estimated the cost at $2,000,000, and at first this was considered a prohibitive amount, because the city was legally empowered to issue bonds for only $500,000. Finally a plan was evolved to form a company and sell stock to the citizens, pay seven per cent dividends on this, and then turn the receipts from water rentals over to the company for payment of the interest and principal. The people generously responded, subscribing $1,200,000 worth of stock, after which the water-rental rates were increased until they yielded $135,000 per year. With these funds, a huge dam, 1,600 ft. in length, was built across the Sangamon River, forming a lake ½ mile wide and 13 miles long, which held approximately 8,000,000,000 gal. The lake submerged 4,200 acres of land. This was immediately purchased by the company, which also was required to elevate several bridges and accompanying approaches, because of the 12-ft. rise in the water. The present industries in the city are now adequately provided for.



Above: Dam of Recently Completed Vast Water-Impounding Project as It Appears during the High-Water Period, and Which was Constructed as a Means of Advancing Industrial Development



At the Left are Seen the Huge Hydraulic Gates with Which the Water-Impounding System is Controlled So That There Is Now a Great Reserve of Water to Provide against Any Emergencies



Another View of the Dam Which Also Shows the Large Lake in the Background That was Formed by the Impounding Project: This Great Body of Water Furnishes Facilities for Boating, Fishing, and Hunting

## SCALE FOR WEIGHING CARGO THROUGH A SHIP'S DRAFT

An ingenious cargo-weighing device, a recent French invention, for use in the hold of a ship below the waterline, consists of a pipe vertically suspended from the beam of a small scale of great precision, that is mounted on top of a conical support inclosing the pipe. By means of a flexible hose the pipe can be placed into communication with the water in which the ship is floating, so that the amount of water in the pipe will vary with the draft of the ship, and consequently with the weight of the cargo. The scale is graduated so that the weight of the water in the pipe will give readings corresponding to the weight of the cargo at any draft of the ship.

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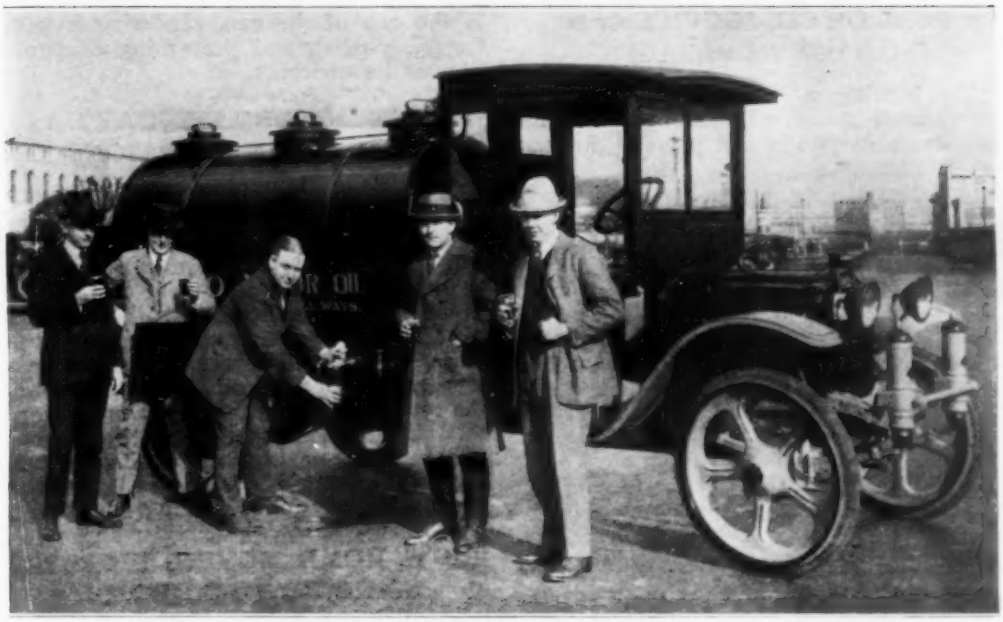
## PIER DECKING CONSTRUCTED WITH SAFETY OPENINGS

To resist the exceptionally heavy seas that prevail there, a concrete pier in Manila Bay has been constructed with a special form of open decking, solid decking being considered unsafe. The pier carries two railway tracks and consists of reinforced-concrete beams supported by precast concrete piles, and the framework of the pier presents a series of openings to the sea below. For the convenience of pedestrians these openings are covered with a decking of 3-in. planks, held down by their own weight alone, so that, in case of heavy seas, they are free to be washed away, offering no resistance to the water. This construction has proved its worth, and the pier has withstood the most destructive typhoons that prevail in the China Sea.

## ONE GASOLINE TRACTOR PULLS FOUR MOWERS AT ONCE

Where the farmer of a generation ago was content to use one mower and a team of horses when cutting his hay, his successor of the present day applies more modern methods, and speeds up the job by hitching four mowers behind his tractor. The draft gear is arranged so that each mower is offset from the one preceding it. This system results in a more uniform cutting and curing of the hay, and, consequently, a better product.

**Modern Methods Applied on a Large Hay Farm: One Gasoline Tractor Draws Four Mowers Arranged So That Each Mower is Offset from the One Ahead. There Is One Attendant for Each Mower**



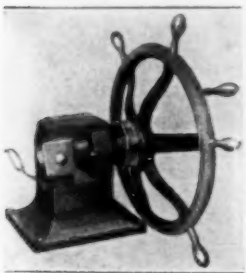
Combination Soda-Fountain and Oil-Tank Truck Which was Employed by an Advertising Company to Feature Its Display at a Recent Auto Show: Officials of the Company are Seen Partaking of Refreshments

## COMBINATION SODA-FOUNTAIN AND OIL-TANK TRUCK

Installing a complete miniature soda-fountain on an oil-tank motor truck was the means employed by an advertising company to feature its display at a recent auto show in San Francisco. The equipment, such as compressed-air cylinders, water containers, and sirup receptacles, was concealed in the large oil tank at the top, while below were placed faucets for drawing the beverages.

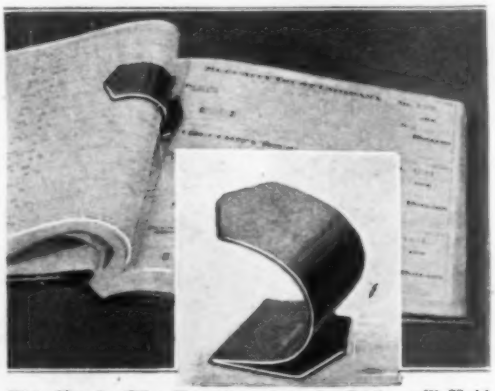
## MACHINE TESTS WORKABILITY OF THIN METAL SHEETS

That tests of the tensile strength of thin metal sheets do not give complete information as to their ability to stand drawing and stamping, has led to the development of a machine which tests this quality. A sample of the sheet is held between two dies and a hemispherical ball is forced against the sheet until fracture occurs. The depth of impression necessary to cause fracture is read directly on a micrometer screw.



## HOLDER FOR CHECK-BOOK STUB LEAVES BOTH HANDS FREE

Anyone who has done posting from the stubs of a commercial check book knows how they have a tendency to slip out of control at the most inopportune times. To overcome this difficulty, a handy little holder has been devised which can be slipped against the stubs to be held back and will hold them securely in place.



This Handy Clip, Forced against the Stubs, will Hold Them Out of the Way When Posting from Stubs to Ledger

¶ The thickest coal seam in the world is being developed in Queensland, Australia. Its maximum thickness is 93 ft., free from clay bands from top to bottom.

## FUEL OR OIL-SERVICE CAN FOR USE IN GARAGES

To furnish a convenient, safe, and economical means of handling fuel and lubricants in public and private garages,

Right, Service Can with Hose as Connected When Not in Use, and Above, When Filling an Auto Tank

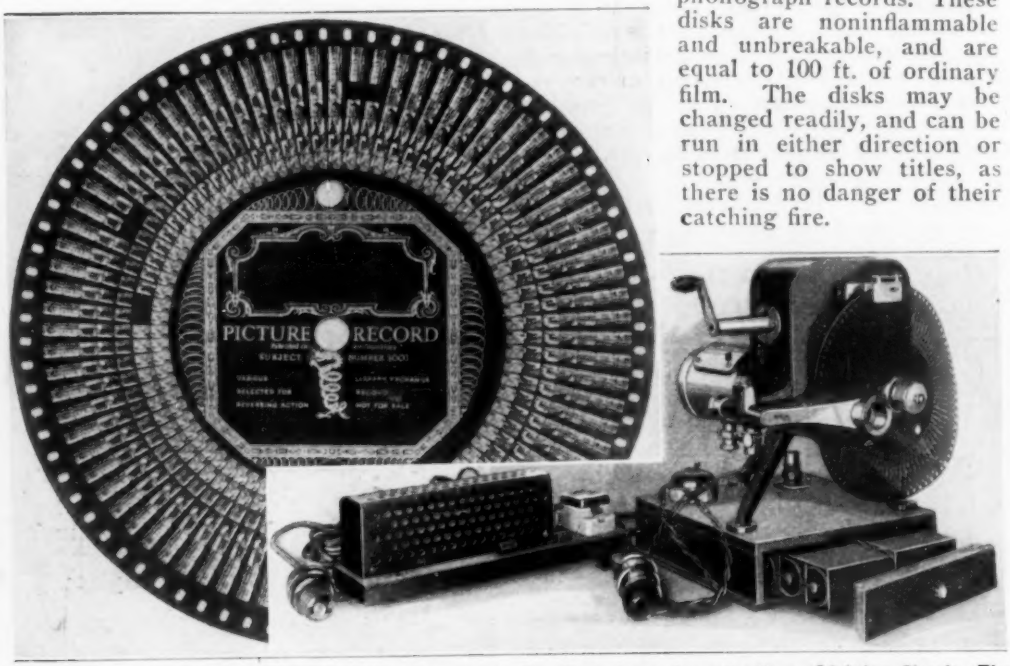
a can is now being manufactured that is easy to manipulate, and that has connected to its discharge opening a flexible steel hose which will reach any gas-tank opening, no matter how inconveniently located. Thus there is never any need of special funnels, which are easily forgotten or mislaid. When not in use, the nozzle on the flexible hose is inserted in a vent in the cap of the can, rendering it perfectly air-tight, and preventing evaporation of its contents.

## LARGE MOTOR LIFEBOAT HAS CABIN ACCOMMODATIONS

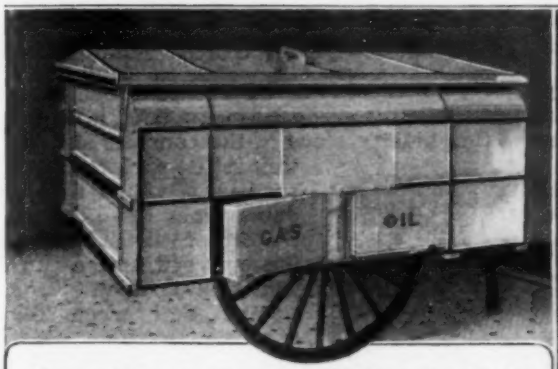
There is now building in England a motor lifeboat that will go far toward robbing shipwrecks of much of their terror. The new boat is 60 ft. long with 15-ft. beam, and has a displacement of 40 tons; it will be driven by two 75-hp. motors housed in separate water-tight compartments. There will be two cabins for passengers, with accommodations for 50, while the total capacity of the boat will be more than 150. One unusual piece of equipment will be a life-saving net to be stretched across the boat, amidships of it, so that passengers may jump into it from vessels.

## SHOW HOME MOVING PICTURES USING NEW PROJECTOR

For industrial pictures, for use in hospitals, or for moving-picture shows at home, a new projecting machine has been devised which can be operated by electric dry batteries or from the regular house-lighting circuit. In place of the usual strip of film, the pictures are made on round disks similar in appearance to phonograph records. These disks are noninflammable and unbreakable, and are equal to 100 ft. of ordinary film. The disks may be changed readily, and can be run in either direction or stopped to show titles, as there is no danger of their catching fire.




This Lightweight Moving-Picture Projector Operates on Dry Batteries or from the House-Lighting Circuit. The Pictures are Made on Noninflammable Disks, Similar in Size to Phonograph Records



Above is Shown the Baggage Trailer Ready for Attaching to the Rear of an Automobile. The Cylinder in Which is Contained the Coil Spring, can be Seen Just above the Center of the Wheel. The Tanks for Gasoline and Oil Are Also Visible. At the Right is Shown the Manner of Raising the Top of the Trailer When Temporary Sleeping Quarters are Desired

## BAGGAGE TRAILER AVAILABLE FOR MOTORIST-CAMPER

Automobile tourists and campers now have available a baggage trailer which possesses special wheel bearings, each wheel being carried independently on a coil spring in a cylinder. The trailer is connected to the towing machine by double spring-steel bands, so adjusted that they hold the baggage container directly behind the car in turning or backing. An added feature is a shelf, the width of a full-sized bed, which is placed above the load, for sleeping or for use as an emergency ambulance.

## FASTENER FOR WALLBOARD IS SELF-CLINCHING

In attaching wallboard to studding, a new self-clinching fastener makes unnecessary the use of nails, which are objectionable because either the heads must be left exposed or they must be countersunk, which is a tedious and expensive job. The fastener, which is made of steel, is about an inch square and has five sharp prongs bent at right angles from one side of it. It is attached to the studs, and the prongs clinch into the wallboard from the back without penetrating it, so that they are invisible from the front surface.

## NEW TELEPHONE MOUTHPIECE PREVENTS EAVESDROPPING

A telephone mouthpiece has been invented which gives to the ordinary desk phone all the privacy of a booth phone. It not only transmits whispering sounds, but effectually screens the voice so that a person standing near the speaker is unable to distinguish the words spoken, hearing only an indistinct murmur.

This Mouthpiece Screens the Voice So That a Person Standing Near By Hears Only a Low Murmur

## MINING TOOLS USED TO STRIP BANK VAULT OF CONCRETE

When it was found necessary to move a bank vault from the first floor to the basement, mining methods were used for removing the protecting concrete around the steel shell. Holes were drilled with a compressed-air drill, and workmen with sledges drove steel pins into the holes, splitting away the concrete in large blocks. No explosives were used.

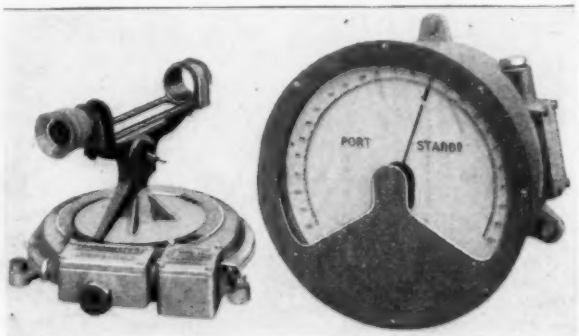
When Removing the Protecting Concrete from This Steel Vault, Holes were Drilled with a Compressed-Air Drill, and the Concrete Broken Away by Driving Steel Pins into the Holes

## CONCAVE INSTEAD OF CONVEX ROADS OF ENGLISH DESIGN

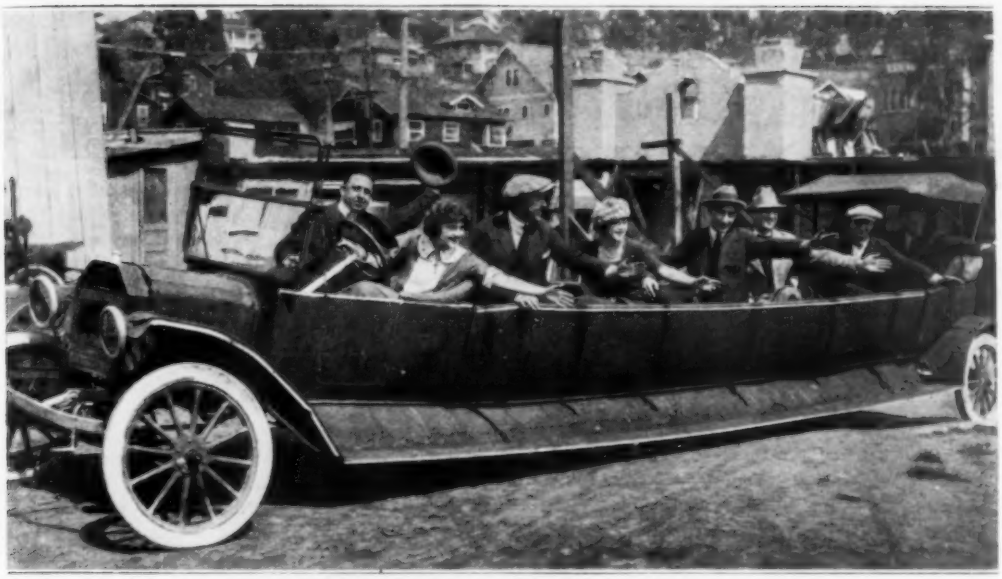
A new system of concrete-road construction is proposed in England, in which the under surface of the concrete slab, as well as the surface of the roadway, would slope down from the sides to the center, instead of being crowned in the conventional manner. It is argued that when the concrete expands sideways under the influence of heat or moisture, if the slope is downward to the center instead of from it, this expansion of the concrete outward will be resisted by its own weight, instead of being assisted by it, as in the other condition. The structural weakness of the concave form is to be compensated by additional steel reinforcement. In a road 30 ft. or more wide, it is proposed to make the sides of the concrete slab slope downward at 1 in 16 to a central level portion, 6 ft. wide. Above this would be the steel reinforcement, with the road surface above finished to a 1-in-40 slope. Beneath the lowest point of the concrete slab, at its center, would be the drainage system.

## LOOKOUT TELEGRAPH FOR USE AS DIRECTION INDICATOR

In common practice, the lookout man in the crow's-nest of a ship, when he observes an object, notifies the officer on the bridge by shouting to him, or at best by means of a speaking tube, and he has to call out the direction. There is now in use in England a much better means of doing this electrically. On the crow's-nest is a transmitter that has a circular dial graduated to degrees and minutes, on which is mounted a revolving eyepiece. When this is trained on an object, the exact position of it to port or starboard is automatically indicated on a similarly graduated dial of a receiver that is mounted on the bridge. At each of these instruments is a bell, by means of which the lookout man signals the officer, and vice versa. The dial of the receiver shows the bearing transmitted to within 1° of arc.




Left: Transmitter That is Mounted on the Crow's-Nest. The Eyepiece is Trained on Any Object, and Indicates Its Bearing on the Receiver on the Bridge, Shown to the Right



**FREAK AUTOMOBILE BODY BUILT FOR COMEDY PICTURE**

COMEDY motion-picture producers go to great expense to evolve new and absurd situations in which the cast perform, and the elongated automobile shown in the accompanying photograph is a late instance of this. An old car of well-known make has been transformed into an imitation motor bus, whose excessive length of wheelbase and the sagging, or bouncing, effect seen when the machine is moving, tend to create a ridiculous impression. However, these and other details have been obtained at a cost which is considered trifling, provided the finished picture accomplishes the desired end—that of making the people laugh.

## WORLD'S HIGHEST WATERFALL IS SELDOM VISITED

Although Kaieteur Fall, in British Guiana, is by far the most powerful waterfall in the world, exceeding both Niagara and Victoria Falls by several hundred feet in height, it has seldom been visited. It was discovered over fifty years ago, but, on account of its inaccessibility, not much is known about it. Recently it was fully photographed by an expedition exploring the Guianas for the American Museum of Natural History. Kaieteur Fall is on the Potaro River, a tributary of the Essequibo. The fall is 741 ft. high, and in width varies from 120 ft. in dry weather to 400 ft. in rainy seasons. The river for about 200 yd. above the fall is about 400 ft. wide, and flows noiselessly along, without a ripple, its surface as smooth as a plate-glass mirror, until it reaches the rocky ridge, where it bends to a right angle and falls in a perpendicular mass that maintains for a distance of 350 ft. its solid appearance, and then dissolves into clouds of vapor before reaching the bottom of the abyss, whence rises a thundering, incessant roar. The fall and the river are surrounded by dense virgin forests, the whole scene being wonderfully imposing.

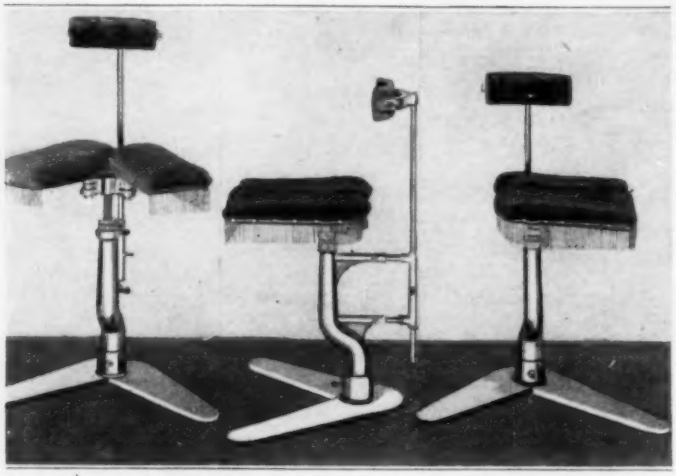
## LARGE WATER WHEEL DRIVES SMALL SUGAR-CANE MILL

In the Philippine Islands water power is used wherever possible, even if the amount of power available is small. In some cases it is used for driving small sugar-cane mills, the stream being diverted and the water wheel directly connected to the rollers which crush the cane. The mill has small capacity, but that does not concern the owner.

**In This Small Sugar-Cane Mill a Small Stream has been Diverted and the Water Wheel is Used for Driving the Rollers of the Mill**

## DIVIDED SEAT FOR ORGANIST MAKES PLAYING EASIER

Considerable physical effort is required of a pipe organist in reaching the various pedals, and to lessen this exertion an Iowa man has constructed a divided seat. When playing, instead of sliding back and forth on the usual bench, the organist can sit on either half of the revolving seat and easily touch the farthermost pedals. The seat can be raised or lowered five inches, be placed any desired distance from the organ, and has a backrest with a spring arrangement, which constantly adjusts itself to the different positions of the player.



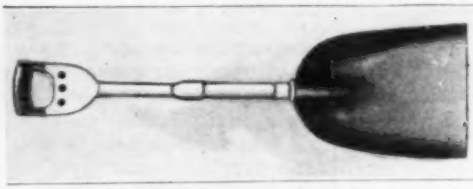
Left: Organist's Divided Seat Shown with the Two Halves Spread Apart. Center: Side View of the Seat, Showing How the Backrest is Attached. Right: Illustrating the Free Movement of the Seat

## FEATHER CORSAGE SHIELD IS COLORFUL NOVELTY

Brides-to-be and débutantes now have available a feather corsage shield which is being manufactured in white, pink, Nile green, yellow, blue, and lavender. Placed on a background of ostrich feathers, are artificial flowers of varicolored hues, the whole being tied with a length of gold ribbon and presenting a most attractive appearance.

## AUTOMATIC COUNTERS RECORD EACH SHOVELFUL OF COAL

In firing a locomotive, the economy of the coal consumed depends a great deal upon the way it is fed into the firebox. Some firemen will get the same results with less fuel than others, and so as to be able to compare the work of different firemen, a coal shovel has been invented that registers on counters every shovelful of coal thrown into the firebox. The shovel has a sleeve over the bottom part of the handle. This sleeve is so constructed that it moves sideways each time a shovelful of coal is lifted, and by the action of a trigger pushes up a rod, in the center of the handle, that operates a series of numbered counters that are inserted in the widened part of the handle. When the coal is discharged from the shovel a spring on the pushrod returns it, ready to register another shovelful. The resistance of this spring keeps the pushrod inactive until the shovel is loaded.



Coal Shovel That Registers on Counters in Handle Each Shovelful of Coal Thrown into the Firebox

## PAPER-MAKING EXPERIMENTS IN WESTERN AUSTRALIA

Experiments are to be made in western Australia to ascertain whether it is possible to produce paper pulp from Australian timber. Contributions of funds from the western Australian and the Federal governments, as well as from private sources, will provide equipment and salaries for carrying out these experiments, and a laboratory will be built.

¶Recent prospecting has shown the existence of radium-bearing minerals on the island of Madagascar.

# BRIDGE BUILDING IN ALASKA TESTS ENGINEERING SKILL

*By George F. Paul*

**Here Are the Dog Teams Carrying Mail to the Northern Points along the Railroad. In Some Parts of Alaska This Is the Only Feasible Method of Handling the Mail during Six Months of the Year**

IF any one were to start out to hunt the steel railway bridge farthest to the northwest on the American continent, he would find it when he reached a point 284 miles north of Seward, Alaska. Here is located the famous Hurricane Gulch, as treacherous as its name is ominous, and over this yawning chasm has now been thrown an arch of steel that tells the triumph of American resourcefulness. Here at this last outpost of railroad life a mighty bridge has been built with an arch span 384 ft. long. Three hundred feet below the rails is the bottom of the

**At Some Points along the Railroad, Freight and Supplies could be Handled by Tractors Drawing Wagon Trains, and This Method was Adopted Whenever It Was Practicable**

gulch. Nearly 1,000 tons of steel went into the arch proper, to say nothing of the 530 additional tons that were needed to build the approaches to the arch. The entire structure is 914 ft. long. At either end of the arch is a deck span 120 ft. long. At the south end is a plate-girder span 50 ft. long, and at the north end a steel viaduct 240 ft. long.

Well might an engineer hesitate when he stood at the edge of this great gash and looked across to the other side where the track would have to strike, if it ever struck that far. He could see that if the arch was to be built by the cantilever method it would be necessary for each half to be built out from the shore and held back by steel backstays. Now it was apparent that it would not be so very difficult to erect the south half of the arch, for the track of this new Alaskan railway ran right up to the south edge of the gulch, and there a construction yard could be established, but the real difficulty would be in getting structural materials across to the north side of the gulch. It was not at all practical to move these materials down through the gulch. To bring them in from the north was out of the question. Cableway transfer was considered, but not adopted for the heavy members. Instead, the final decision was to lower the members to the bottom of the gulch by a locomotive crane standing on the outer end of the south half of the arch. An A-frame derrick was made ready on the north side. Its load falls were lowered to the bottom of the gulch and hitched to the member. Then both sets of falls were taken up at the same time. This brought the member up along the slope until it was just beneath the position that it was to occupy permanently. Then the locomotive crane falls were released and the A-frame derrick lifted the member up to its place. The maximum gap between the erecting units was 192 ft., but this method put no more strain on each boom than when either boom had to carry the whole load vertically.

As far as possible, the material was riveted at the yard. The center of gravity for each bottom-chord member was figured out carefully in the drawing room. Then when the hitches were made, they were applied at such points that the chords would hang in practically their permanent position while they were being placed.

**This Shows Work Progressing on One of the Tunnels along the Route. In Some Cases It was Deemed Advisable to Drive Tunnels Rather than to Make Deep Open Cuts through the Rock. The Formation at This Point Is Hard Slate**

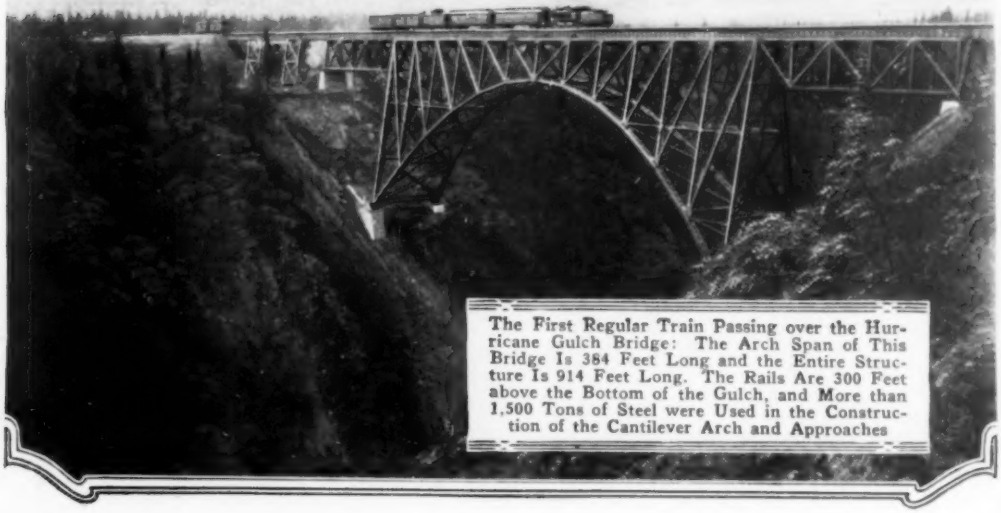
Great care was taken to get the shoes of the arch set at the proper distance apart. A 500-ft. steel tape was used; it was corrected for temperature. The maker of the tape had marked it to measure the distance of 384 ft. while supported only at the zero and 384-ft. marks under a tension of 50 lb. The real test came when the halves of the arch were lowered to position—they fitted accurately.

Backstay bars connected the anchorages to the 120-ft. approach spans. These were telescopic in action. Two pairs of backstay bars were provided at each anchorage. A 500-ton hydraulic jack was inserted in the telescopic joint of each pair. During the erection work the ends of the arch halves were slightly elevated at the middle of the structure. Steel shims in the telescopic joints held them in this position.

At the proper time pressure was applied to the hydraulic jacks, the shims were

This View of the Hurricane Gulch Bridge during the Course of Erection, Gives Some Idea of the Difficulties Overcome by the Construction Gang, as All Material was Handled from the South Side of the Gulch

Along Turnagain Arm, Because of the Irregular Contour of the Country, Heavy Rock Cuts Were Necessary through Walls of Hard Slate



The First Regular Train Passing over the Hurricane Gulch Bridge: The Arch Span of This Bridge Is 384 Feet Long and the Entire Structure Is 914 Feet Long. The Rails Are 300 Feet above the Bottom of the Gulch, and More than 1,500 Tons of Steel were Used in the Construction of the Cantilever Arch and Approaches

loosened and withdrawn, and then the halves of the arch were lowered to a bearing on a pin in each bottom chord at the center.

This new railway being built by the United States government is to connect the Matanuska coal fields with tidewater. Railroad building presents endless difficulties in Alaska. In some inland parts the working season is cut short by the heavy snowfall that starts in early. In the spring the work is also delayed, because of the deep snow.

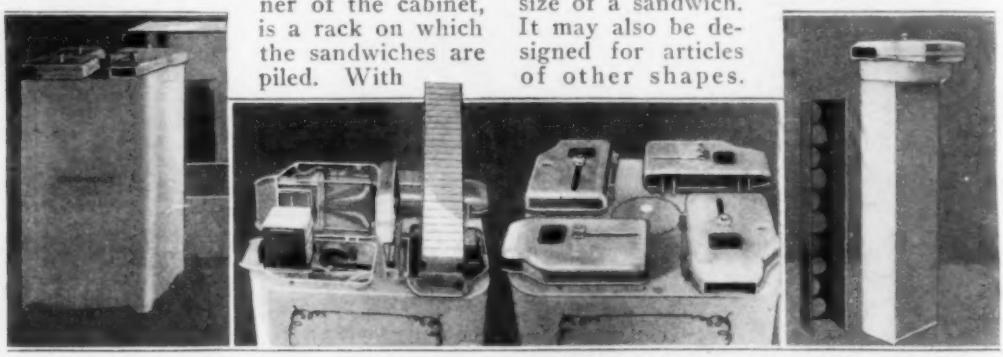
The work that was done between Seward and Anchorage along Turnagain Arm, a branch of Cook Inlet, is typical of the difficulties encountered. For the greater part of this distance the line had to be cut in on heavy slopes. The contour of the country is very irregular. Deep embankments and gulches occur in many cases, and in order to save expensive cuts in the precipitous rock bluffs it was necessary to make heavy fills. The rock is mostly of a hard slate. More than 2,000,000 cu. yd. of excavation was necessary along Turnagain Arm, about half of which was through solid rock. At several points on this line truss bridges were necessary over the larger streams. It is estimated that about 8,000 ft. of snowsheds will be required in this district.

Anchorage is 114 miles north of Seward. It is at the head of Cook Inlet, and consequently can be reached by ocean steamers. Here the government proposes to build a wharf 80 ft. high. This great height is necessary to take care of the 42-ft. change of water level and to provide six fathoms of water at low tide. This wharf, which will be 1,000 ft. long, will have wings running back to the shore from either end, one of them wide enough to carry three standard-gauge railroad tracks, out to the coal bunkers on the wharf. Here Matanuska coal will be stored and delivered to vessels. As Anchorage is much nearer the coal fields it will be more convenient for coal to be handled from this point. However, in the winter season, it may be found a better plan to have the coal shipped south to Seward and loaded on boats there.

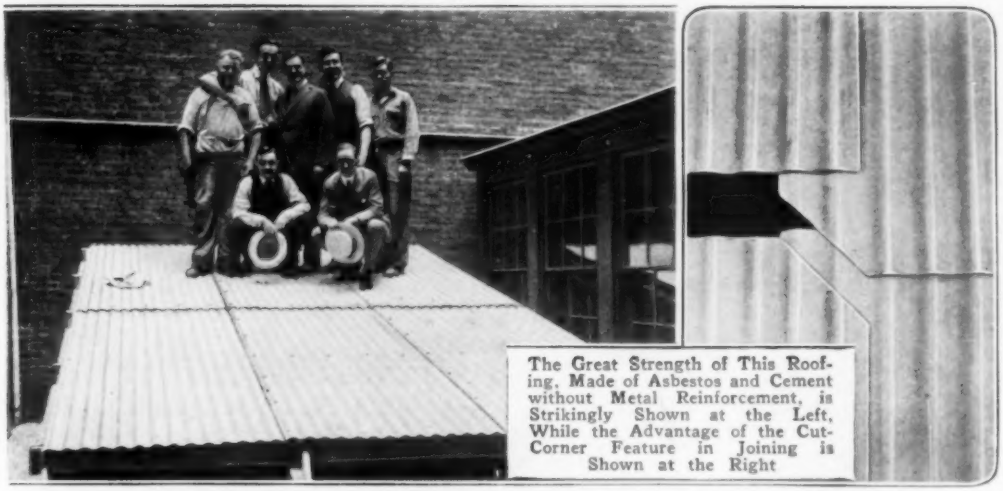
The railroad work done in Alaska impresses a person with the vastness of the country and with the tremendous resources that Nature has stored there in lavish abundance against the day when the coal and the wood and other riches of mountain and valley would be needed and men would have the means and the energy to prepare a great highway along which these resources could be shipped to places where they are needed.

## MACHINE VENDS SANDWICHES AND KEEPS THEM FRESH

There have for a long time been machines that deliver one or more sandwiches in response to the insertion of a coin, and now there is one that also keeps the sandwiches fresh and cool. The main boxlike body of the machine is a refrigerating cabinet with a central compartment for holding ice. Around this, at each corner of the cabinet, is a rack on which the sandwiches are piled. With each insertion of a coin, this pile is raised sufficiently to deliver one sandwich to the depositor of the coin. To extract a sandwich, a knob is pulled, which is normally locked until released by the coin. The sandwiches are visible, and when all have been delivered, the sign "empty" becomes visible instead of a sandwich, and the coin slot closes. The machine can, of course, be used for other articles, provided they are of approximately the size of a sandwich. It may also be designed for articles of other shapes.



Left: General View of Sandwich-Vending and Refrigerating Machine. Center: Two Top Views, the One at Right Showing Device at Each Corner for Delivering Sandwiches, the Other Showing Two of These Open, with Sandwich Piles Raised. Right: One of the Racks in Which Sandwiches are Piled



The Great Strength of This Roofing, Made of Asbestos and Cement without Metal Reinforcement, is Strikingly Shown at the Left, While the Advantage of the Cut-Corner Feature in Joining is Shown at the Right

## STRONG CORRUGATED ROOFING OF ASBESTOS AND CEMENT

The exacting requirements of the chemical, gas, oil, and allied industries demand an unusual roofing, one that resists not only weather and time, but fire, condensation, and corrosive vapors as well. In answer to this need, a new roofing is now being manufactured that is made of asbestos fiber and Portland cement and molded under great hydraulic pressure into dense, tough, and structurally strong sheets that are inert to the destructive elements encountered in boiler rooms, chemical plants, refineries, refrigeration plants, fertilizer plants, and other places where chemical fumes and fires must be guarded against.

This corrugated, artificial stone roofing is furnished in sheets 8 ft. long, 42 in. wide, and ¼ in. thick, and weighs 3½ lb. per square foot. Due to the inside and outside radius of the corrugations being similar, the nesting of the sheets is perfect, a great aid in making the roofing more weatherproof and water-tight, and because of its unusual structural strength this newly developed roofing can be laid on spans of 45 in., thus affording a substantial saving in the supporting framework.

Another exclusive feature is the bevel-cut corners which permit the sheets to nest tightly at the joints. These cut corners not only avoid unnecessary extra thickness at the joints, but eliminate the wedge-shaped openings which permit wind and rain to enter the building. Another advantage of the cut corners is that, in the application of this new roofing, sheets can be laid in straight, continuous, horizontal, and vertical lines, greatly improving the appearance of the finished job. No metal reinforcement is used in this roofing material.

## FILIPINOS USE LARGE DIP NET AND DERRICK FOR FISHING

When the natives of the Philippine Islands go fishing they do not have the conveniences of the modern fisherman, but they manage to get the fish with the material at their disposal. They use a large dip net supported from a bamboo derrick on a raft of the same material. The net is lowered to the bottom of the stream

This Is the Style of Bamboo Raft and Derrick That is Used by the Native Fishermen of the Philippine Islands

and the raft moved ahead. The net is then raised and the captured fish fall to the center of the net and are dipped out.

¶ Two flying boats, for passenger service, broke existing records recently, by making the trip from New Orleans, La., to Chicago, Ill., in 13 hr. 10 min. actual flying time.

## REAMER WITH MOTOR DRIVE WHOLLY SELF-CONTAINED

Reaming by hand is rapidly being superseded by power-driven tools. An entirely self-contained machine of the kind consists of a sturdy pedestal that carries a ⅛-hp. electric motor, and, beside it, a small assembling bench. The motor is belted through a three-speed cone to a self-locking worm-gear reduction above it, and this rotates a chuck that holds the reamer horizontally, and at a convenient height for the operator. The machine can be run from any lighting circuit. It has a capacity up to 1½ inch.

## ELECTRIC TIMING MECHANISM FOR VARIOUS USES

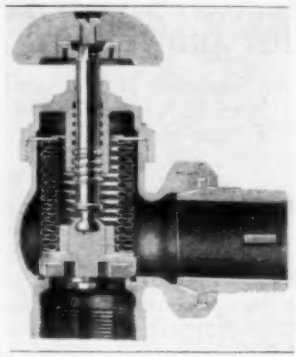
Whenever the element of time enters into a manufacturing process, the use of a new timing instrument will be found to be valuable. The appliance has a dial graduated into seconds, and an indicating hand which may be set at the predetermined interval, in seconds, from "zero." The mechanism is then connected to the ordinary lighting circuit, and the small synchronous motor within accurately tolls off the time as the hand moves back to zero.

## FIREPROOF BULKHEAD DOORS MADE OF MAHOGANY

Ships' bulkhead doors are now being made, in England, of mahogany fireproofed by a timber fireproofing system that, in itself, is not new, though its application for this purpose is of recent date. On the new Cunarder "Samaria," these doors are 7 ft. high, 4 ft. wide, and 1⅞ in. thick. Several other large vessels, now being built in England, are to be fitted with similar doors.

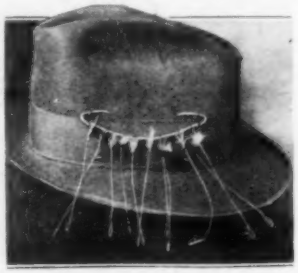
## RADIATOR VALVE LEAK-PROOF WITHOUT ANY PACKING

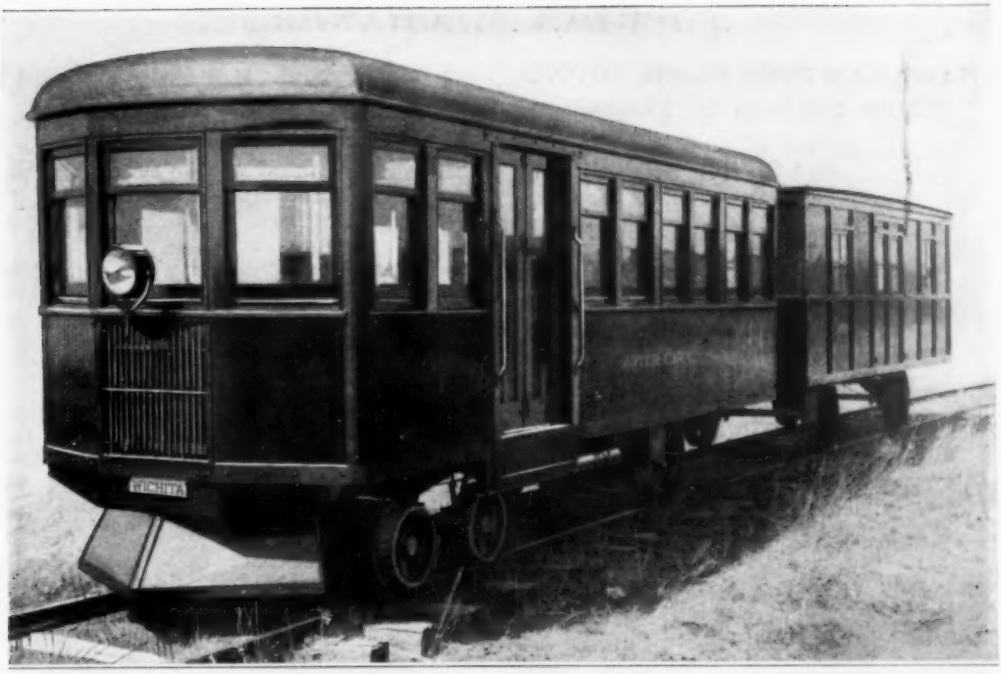
A radiator valve that is proof against any leakage, without the use of packing, is fitted above its valve disk and around its stem with a brass bellows that expands and contracts as the valve is opened or closed, and at the same time always forms a barrier to the passage of steam, water, or air from the steam piping to the exterior. There is no friction on the bellows, and nothing to cause wear excepting its expansion and compression, which occurs so seldom that the life of the valve should be practically equal to that of the radiator.



## CONVENIENT FLYHOOK HOLDER MADE OF BRASS SPRING

Any fly fisherman who has had occasion to search through his book just as the fish started to strike will appreciate a new patented holder that can be fastened to a soft hat and holds twenty or more flies in a brass spring, in such a way that they may readily be detached when wanted.



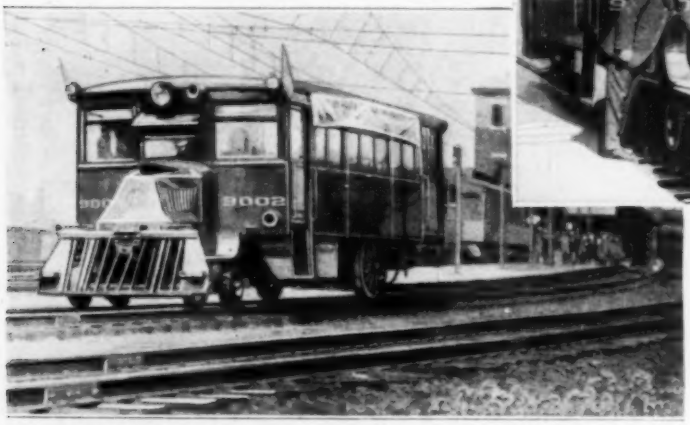


Gasoline-Driven Rail Car and Trailer Built for the Jefferson and Northwestern Railway in Arkansas: The Front Axle of the Car has been Replaced with a Four-Wheel Truck Pivoted in the Center. The Front Wheels Are 20 Inches, and the Other Wheels Are 30 Inches in Diameter

## GASOLINE-DRIVEN RAIL CARS CUT OPERATING COSTS

Gasoline-driven cars have been introduced on two more railroads in this country, namely, the New York and New Haven, and an Arkansas short line, called the Jefferson and Northwestern. The former road employs a car that has a seating capacity of 78 persons, a speed of 40 to 50 miles per hour, and is said to lower the operating costs by half. The car recently finished for the Jefferson and Northwestern, carries 30 people and 3,000 lb. of baggage, besides a trailer for freight, and attains a speed of 45 miles per hour with a 40-hp. engine that burns either gasoline or kerosene. These new carriers are completely equipped with all the conveniences found on the latest passenger trains, and railroad officials who have witnessed demonstrations of this departure in transportation, have unanimously declared themselves satisfied with the results.

Another View of the New York and New Haven Car, Showing the Hood Raised, Exposing the Ordinary Gasoline Motor Similar to Those Installed in Trucks



Gasoline-Driven Rail Car Operated by the New York and New Haven Railroad as It Appeared When Leaving the Yards on the Final Test Trip

## HAWAIIAN TREE FERNS FOUND TO BE SOURCE OF STARCH

Always admired as a thing of beauty, and marveled at because of their great size, the tree ferns of the Hawaiian

These Tree Ferns of the Hawaiian Islands have been Found to Be a Potential Source of Starch, Equal in Quality to the Best of the Corn Starches

Islands have been considered as of no commercial value, but an accidental discovery indicates that they may become the source of large revenue. The tree ferns grow abundantly on the sheltered portions of the islands, the trunks often being as large as a man's body and more than 10 ft. high. When the outer bark is chopped away and the thin inner bark removed, there remains a core, about 6 in. in diameter, which is almost pure starch. When this is ground, screened, and thoroughly washed, it produces a pure white starch claimed to be fully as good as the corn starches or more expensive arrowroot. The tender young fronds of the tree fern may also be cooked as a vegetable, and, when so used, resemble cauliflower in taste.

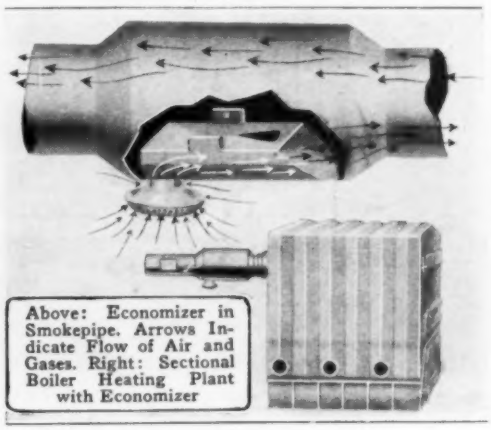
## LAKE LEVELS NOT PARALLEL WITH SEA LEVEL

The northern end of a quiet lake whose top surface is not given a slant by wind or currents, is nearer parallelism with sea level than its south end. The larger the lake and the higher it is above the sea, the greater is this effect. In Lake Michigan it would amount to a little more than three inches.

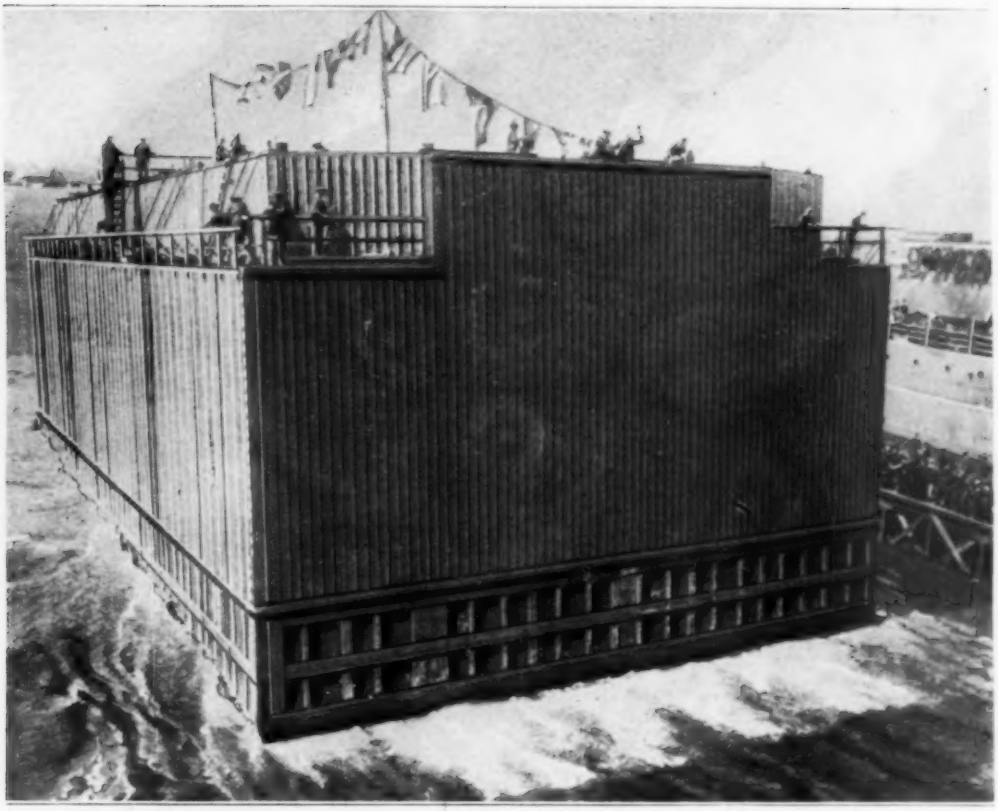
This condition arises from the facts that the earth is not a perfect sphere and is turning about its axis so that a centrifugal force is developed which opposes its attraction, an effect which has its maximum at the equator. If the sea were raised by the addition of water, the level would increase slower at the poles than at the equator, and a change of elevation at the poles of 1,000 ft. would be accompanied by a rise of sea level at the equator of 1,005 ft. In other words, level surfaces at different heights are neither parallel with the surface of the sea nor with each other, and at the equator they would be the farthest distance apart. This has to be taken into account in the precise surveys made by the Coast and Geodetic Survey. For instance, in a line of levels from San Diego to Seattle, which runs much of the way over high ground, the correction is 1¼ meters, or about 50 in., an amount which is far from negligible.

## ATTACHMENT FOR FURNACES IS FUEL ECONOMIZER

Already in extensive use, and highly recommended by the users, is a new scientific device that is guaranteed to reduce fuel consumption in furnaces 25 per cent or more. The device is automatic, and is inclosed in a steel drum that can be fitted to any smokepipe between the furnace and the chimney. It acts as a carburetor to the furnace, drawing live, oxygen-laden air from the outside, superheating it, and spraying it back over the fire. It is claimed that besides economizing fuel consumption, it also reduces largely the amount of ash and the volume of smoke, and that it increases heat efficiency.

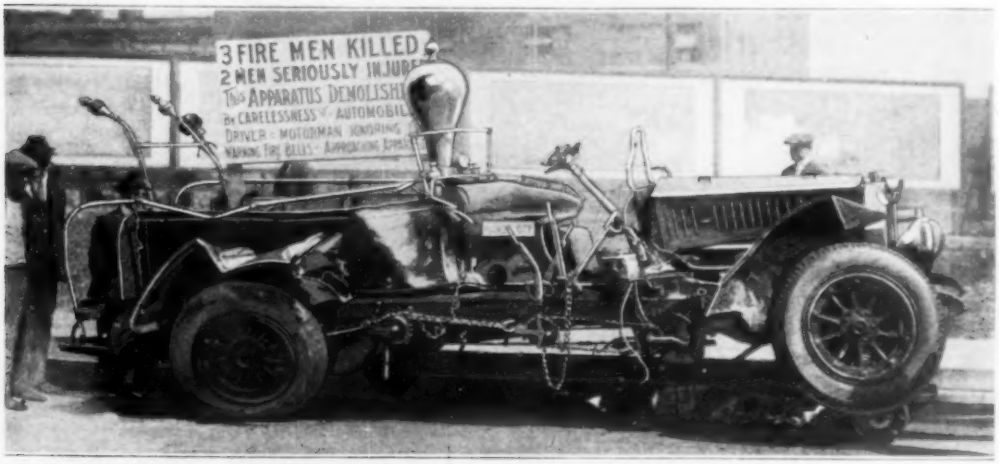


Above: Economizer in Smokepipe. Arrows Indicate Flow of Air and Gases. Right: Sectional Boiler Heating Plant with Economizer



LAUNCHING A CAISSON FOR THE DELAWARE RIVER BRIDGE

THE largest caisson ever built, 143 ft. long, 70 ft. wide, 65 ft. high, and weighing 1,600 tons, to be used in the construction of the Delaware River Bridge, is shown in the act of being launched at the yards of the New York Shipbuilding Corporation, Camden, N. J. Six hundred thousand feet of lumber were used in the building of the caisson. It is called "Caisson A," and is for use in building the pier at the Philadelphia side of the river.




A WARNING SIGN THAT CANNOT BE IGNORED

IN the effort to prevent a recurrence of similar accidents, this demolished piece of fire apparatus was used as a warning sign in St. Louis, Mo. The sign placed over it tells briefly the story of the accident, and points out the reason it occurred. Surely, such a warning should bring home to every driver of an automobile the necessity for observing the warning signals of approaching fire apparatus rushing to the scene of a fire.

COAST-GUARD CUTTER PASSING BETWEEN TWO ICEBERGS

WHEN these giant masses of ice break from the northern glaciers and drift southward into the north Atlantic Ocean, they become a serious menace to navigation. Some idea of the size of the bergs may be obtained by comparing them with the size of the coast-guard cutter "Seneca," remembering that icebergs float with only one-ninth of their total bulk above the water. Fortunately these floating danger spots melt rapidly when they encounter the warmer air and water found in the more temperate zones.

## TWO-STORY HOUSE ON STILTS HAS ELEVATED BASEMENT

The city of Prince Rupert, B. C., is situated on very hilly ground, and in some instances houses were built before the grading operations were completed, which has led to many unusual sights. In one case a house was built with the first floor level with the street, but the ground was so far below the street level that it was necessary to support the basement on long timbers. A narrow wooden bridge leads from the sidewalk to the first floor of the house.

This House was Built before the Land was Graded, and While the First Floor Is at Street Level, the Basement is Supported on Stilts at a Considerable Height above the Ground

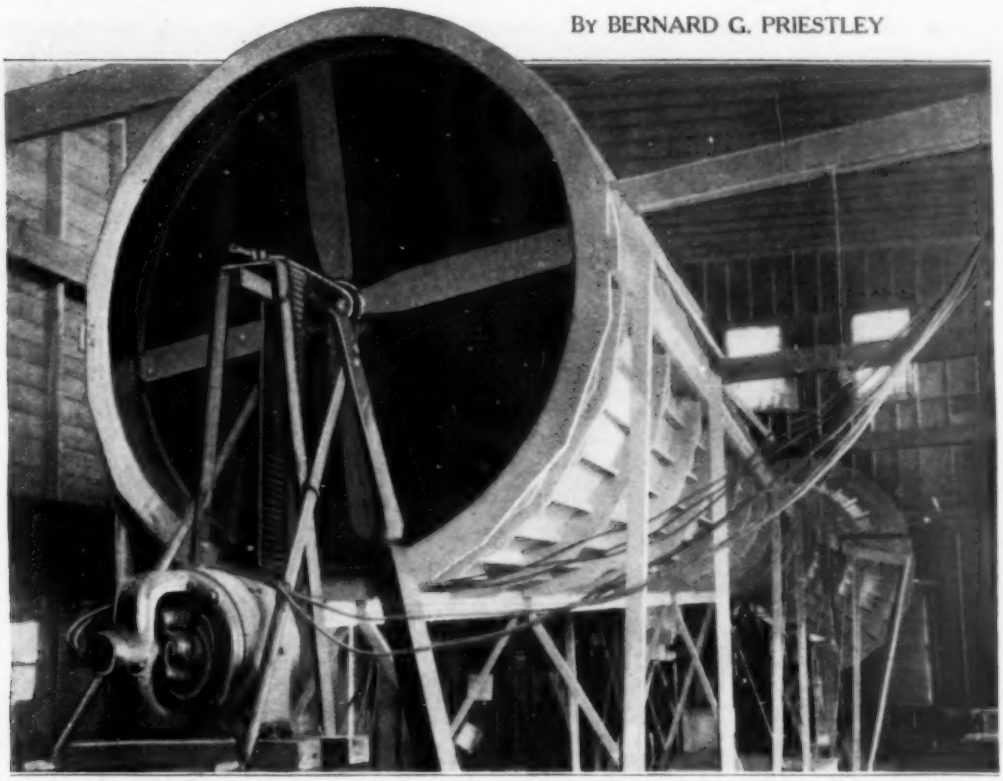
## ROAD-REPAIR PATROL SYSTEM FOR PROVINCE OF QUEBEC

Plans are under way in the province of Quebec, Canada, for the establishment by the Department of Roads of a patrol system which will keep in repair all the improved highways of the province, 4,000 miles in extent. An organization is to be established which will enable the Minister of Roads to know with exactitude the condition of each section of road, the road mender in charge, and the amount of repairs being done. Under the new plan, while the municipalities will be under less expense, it will be necessary for them to work in harmony with the provincial government by passing by-laws permitting the minister to take care of the roads. As a result of this system it is expected that before the end of this year all roads in the province will be in good repair.

¶At the Croydon Air Station, near London, an airplane "taxi," seating three passengers, is maintained ready for immediate flight, the rate being a flat charge of less than 50 cents per mile.

# NEW-TYPE WIND TUNNEL FOR AIRPLANE TESTING

By BERNARD G. PRIESTLEY



New Type of Wind Tunnel for Testing Models of Airplanes at the Massachusetts Institute of Technology, about 40 Feet Long and with Four Feet Inside Diameter: At the Opening is Seen the Motor-Driven Propeller Fan That Sets Up a Wind Velocity of from Two to 65 Miles an Hour.

AN entirely new form of wind tunnel for the testing of model airplanes has been put into operation at the Massachusetts Institute of Technology. Because of its efficiency and ability to develop a high wind velocity, this tunnel is proclaimed by aeronautical engineers as the best constructed in the comparatively short time that tunnels of such type have been in use.

Unlike the square-shaped older tunnels, this one is circular in construction. Heretofore the most common practice in constructing these tunnels has been to use wood entirely. Sheet-iron or wooden frames, lined with fabrics, have been tried, but have not proved wholly satisfactory. Part of this tunnel—the end through which the air enters—is made of plaster, worked to form by hand, then varnished and polished. The remainder is made of built-up wooden frames covered with thin sheets of veneer. The new methods of construction made the tunnel comparatively inexpensive, besides reducing its weight to a minimum consistent with greatest efficiency.

PHOTOS COPYRIGHT, FAY S. LINCOLN

Two Observers Taking Readings from the Wind-Tunnel Balance: The Model being Tested Is above the Opening in the Tunnel Floor, over the Balance Stand

The tunnel is about 40 ft. in length and 4 ft. inside diameter. It runs lengthwise inside a building, and is mounted about 12 ft. from the floor on

a wooden scaffold reinforced by adjustable iron rods that lessen vibration when the air is forced through the tunnel.

Wind velocity is developed in the tunnel by means of a large propeller fan driven by an electric motor. The wind speed is kept constant by an automatic regulating device. The maximum velocity obtainable is 65 miles per hour and the minimum, two miles per hour. In the old square tunnel that the new one replaces, the same input of power would develop a maximum wind velocity of only 40 miles an hour.

In the floor of the tunnel, midway of its length, is an opening through which is projected the model airplane to be tested. The model is supported on a balance used in much the same way as any pair of scales. This balance, however, has a much greater range of adjustment and is considerably more complicated than ordinary scales. It permits accurate weighing of the lift and resistance of the models. These weighings enable calculating the speed at which the full-size plane must fly in order to maintain itself in the air, and the horsepower that will be required to drive it at the necessary speed.

The tunnel is used largely to test models of new types of airplanes. Models have about a 2-ft. wing spread, but their dimensions are comparatively the exact dimensions—down to one-five-hundredth of an inch—of the full-size plane. It costs as much as $1,000 to make a model. Wind tunnels afford the only way of investigating air forces, steadiness of motion, and effectiveness of control, without trying the full-size airplane in the air—a most dangerous procedure in experimenting with new types.

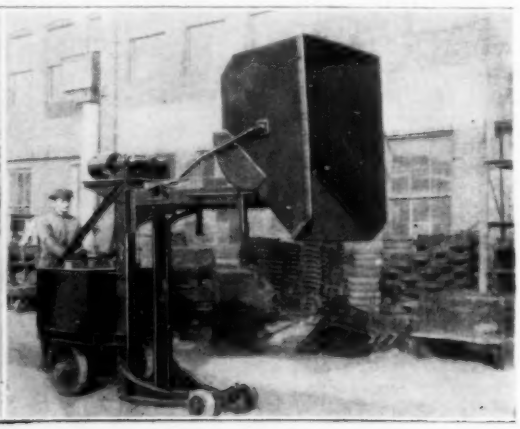
Uses of the tunnels are by no means confined to testing of airplane models. They can be used to test the wind pressure on buildings, the wind resistance of motor cars, and for various other tests in which the element of wind velocity figures.

## END-DUMPING BODY MOUNTED ON LEGS OR ROLLERS

Bulk materials, such as sand, coal, ashes, etc., can be handled efficiently with a combined end-dumping body and elevating platform truck, which is manufactured by a Cleveland concern. The body possesses steel legs, to which wheels or casters may be attached, has a capacity of 27 cu. ft., or 2,700 lb., and a special rocker arrangement for dumping from the elevating platform. This platform has a lift of 96 in., so that it is convenient to raise the loaded body and empty it into a wagon, motor truck, or other vehicle used for hauling purposes.

## DEVISE TEST FOR DETECTING PRESENCE OF REMADE MILK

Because of the increased use of remade milk, manufactured from powdered or condensed milk and sweet-cream butter, it has become necessary for chemists to devise some test that will indicate its presence in milk products. If the curd from remade milk is dissolved in sodium hydroxide, it shows a characteristic yellow color, after standing, while natural products or products containing only a small percentage of remade milk, do not show this color. As little as 10 per cent of remade milk can be detected by this test when carefully made.



Above is Seen the Combined End-Dumping Body and Elevating Platform Truck with the Body Raised Several Feet from the Ground by the Lifting Mechanism. At the Right is Shown the End-Dumping Body at Its Highest Elevation for Emptying into Wagons or Trucks

Huge Log being Hauled with Its End Supported on a Dolly, or "Bummer," That Has a Truck Fitted with Continuous-Tread Traction Wheels Similar, on a Smaller Scale, to Those of the Tractor That is Hauling It. This System of Traction Allows the Tractor to Haul Heavy Loads over Soft Ground

## CONTINUOUS-TREAD TRACTION SYSTEM FOR HAULING LOGS

The continuous-tread system, similar to that used on ordinary tractors, is now being used in skidding logs in the logging sections of the Pacific Northwest. In place of the usual dolly with a pair of round wheels, on which one end of a heavy log is mounted, a truck with continuous-tread traction wheels is used. On the front of this truck is a tongue to which is hitched a tractor for hauling it. This dolly, known as a continuous-tread "bummer," is pushed under one end of the log, and enables the tractor to haul much greater loads over soft ground than is possible with ordinary round wheels.

## PNEUMATIC CORK EXTRACTOR ACTS WITH AIR PRESSURE

Quite a novel method of extracting a cork from a bottle is to blow it out by air pressure. A bowed, thin, hollow air conductor is inserted between the cork and the neck of the bottle. Outside the bottle this is bent at right angles and leads to a small pipe, to which is connected an air pump that forces air into the space in the bottle between its contents and the bottom of the cork. The device is of German origin.

Extracting a Cork by Air Pressure: The Hand Pump Forces Compressed Air into the Space between the Bottom of the Cork and the Contents of the Bottle

## MAMMOTH LOOSE-LEAF BINDER LARGEST EVER BUILT

Being a veritable "Goliath" in size when compared with their usual product, a mammoth loose-leaf binder was delivered recently by a Michigan firm to a Texas customer. The huge article, said to be the largest ever built, measures 41½ by 54 in., making it 9 ft. wide when open. It weighs 100 lb. empty, and 500 lb. when filled with its capacity of 11 in. of sheets.

Mammoth Loose-Leaf Binder as It Appears in Comparison with a Binder of the Size Commonly Seen

## IMPACT DEVICE RECORDS ANY ROUGH HANDLING OF CARS

The annual claim made against the railroads for goods damaged by rough handling in shipment, runs into staggering figures ($2,000,000),

Graphic Meter for Recording Impact, Inclosed in a Sealed Case, is Placed on the Train being Observed. A Weighted Pencil, Held between Two Springs, Draws on a Graduated Strip of Paper Moving beneath It, a Record of the Impacts Received

some of which can be charged to careless handling when cars are coupled. In any effort to reduce this loss, an impartial record of the way cars are handled is necessary. To accomplish this, a compact machine has been devised in which a weighted pencil, held between springs, draws on a moving strip of paper the record of the way the car is handled. The impact register is placed on the train to be observed, and is sealed to prevent persons tampering with the mechanism or the record. It has been found that cars coupled at a speed of more than three to four miles per hour constitute a case of rough handling, in which car and contents may be damaged.

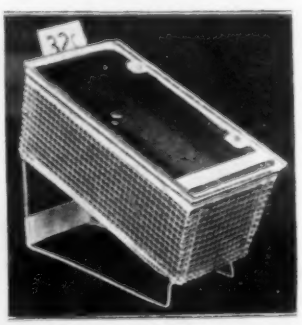
## "CANNED OATS" FED ARMY HORSES SUCCESSFULLY

Compressed forage, composed of pure oats and other grains, pressed into bricks made with a binder of molasses, has been successfully developed at Camp Lewis. The bricks are 12 in. long, 6 in. wide, and 1½ in. thick. Perforations make it possible to break up the bricks by hand if only portions are to be fed to the army horses or mules. With the new compressed feed, it is pointed out, a horse can go into battle carrying its rations like the soldier carries his own.

Tests were made on fifty animals at Camp Lewis, and all but four took readily to the new compressed feed, according to the report of the chief camp veterinarian. With the exception of two of the animals, all gained weight and maintained their working efficiency. No sickness was observed. One stallion gained 46 lb. in thirty days.

The mules disliked the ration at first, but soon became fond of it. For a number of years, army officers state, efforts have been made to solve the problem of easily transporting horse feed during campaigns. The British supply officers in Egypt who were confronted with heavy obstacles in forwarding supplies during their recent expedition against the Arabs, evolved a type of compressed feed by using cotton baling presses to reduce the bulk, but this was not very satisfactory, since the weight was not reduced. The new type of compressed feed developed at Camp Lewis is intended to take the place of the oat ration only.

## SANITARY DISPLAY STAND PRESERVES FRUIT



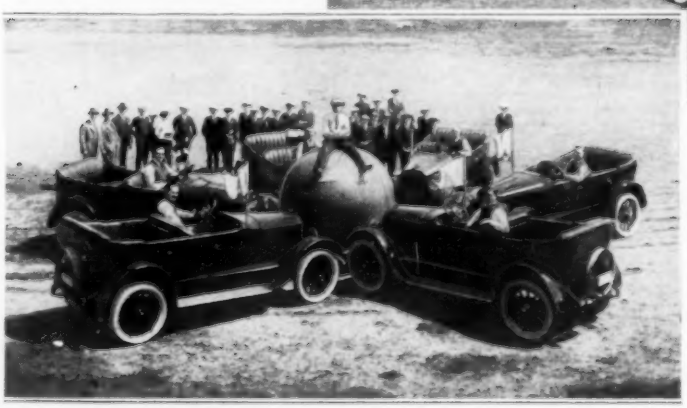
Fruit and vegetables of all kinds may be preserved in perfect freshness for many weeks by the use of a sanitary, metal display stand, or basket, invented by a New Mexico man. The basket is lined with burlap saturated with an antiseptic solution, the evaporation of which cools and gives the proper amount of humidity; and at the same time the lining acts as a cushion to prevent the bruising of the contents.

CANOES MADE BY SOUTH PACIFIC ISLANDERS

IN MAKING canoes, similar in some respects to the well-known American Indians' dugouts, the natives of the islands of the New Hebrides, in the south Pacific Ocean, always select trees that have been bent by the wind. This enables them to make a canoe with an upturned prow like the Malay proa, which it further resembles by having an outrigged float.

## "PUSH-BALL" GAME PLAYED WITH AUTOMOBILES

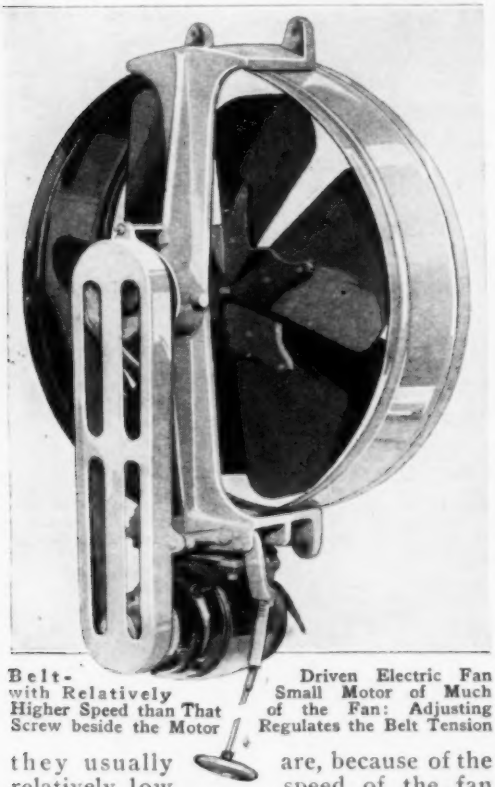
"Push ball," a game which is usually played by men on foot, was enjoyed recently by the drivers of six automobiles and numerous interested spectators. The cars were stripped of windshields and tops, lined up at opposite ends of the field, and, at a given signal, furiously charged the large inflated ball. Although the sport was necessarily rough, considerable skill was evidenced by the different drivers in averting mishaps, and when the game was finished, it was found that none of the machines had suffered the slightest damage in any way.



Above is Shown the Huge Ball in the Center of the Field, with the Six Automobiles Waiting for the Referee to Give the Signal for the Opening Charge. At the Left are Seen the Participants at the Finish of the Game

## BELT-DRIVEN ELECTRIC FAN WITH HIGH-SPEED MOTOR

When ventilating fans are direct-connected to the motor that drives them, as



Belt-Driven Electric Fan with Relatively Small Motor of Much Higher Speed than That of the Fan: Adjusting Screw beside the Motor Regulates the Belt Tension

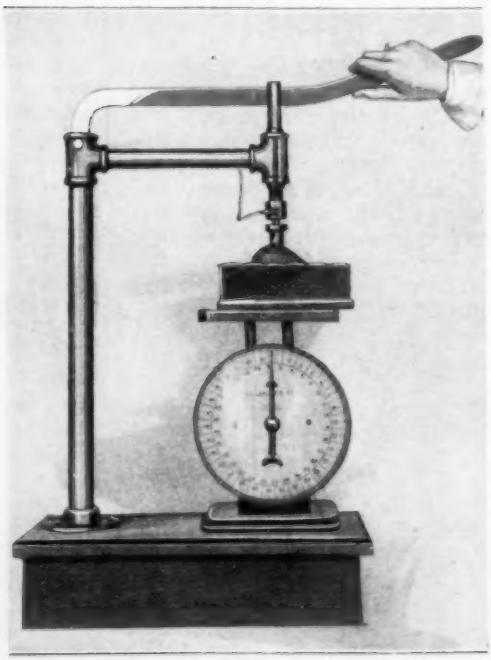
they usually are, because of the relatively low speed of the fan comparatively large motors are required to drive them. A new belt-driven fan is now being built, in sizes from 16 to 48 in., which, having a much larger pulley on the fan than on the motor, permits the use of small high-speed motors, of much smaller size than if the fan were direct-driven. The motor is adjustable on the fan frame, so that the belt tension can be regulated, and the pulleys are self-cooling, preventing overheating of the belt or pulleys.

## REMARKABLE SPEED OF SOUND IN TELEPHONE CIRCUIT

A rather interesting comparison of the speed of sound over telephone circuits and through the air, was brought out in a recent long-distance telephone test. In this trial, there was made what is probably the longest telephone circuit ever established, starting from Havana, Cuba, up the Atlantic coast to New York, across to San Francisco, down the Pacific coast to Los Angeles, and then to Catalina Island. The connection was approximately 5,600 miles long and the transmission of the voice from one end of the circuit to the other required only the tenth of a second. If it had been possible for the sound to have traveled over the same course through the air, it would have taken in the neighborhood of seven hours for the sound to reach its destination.

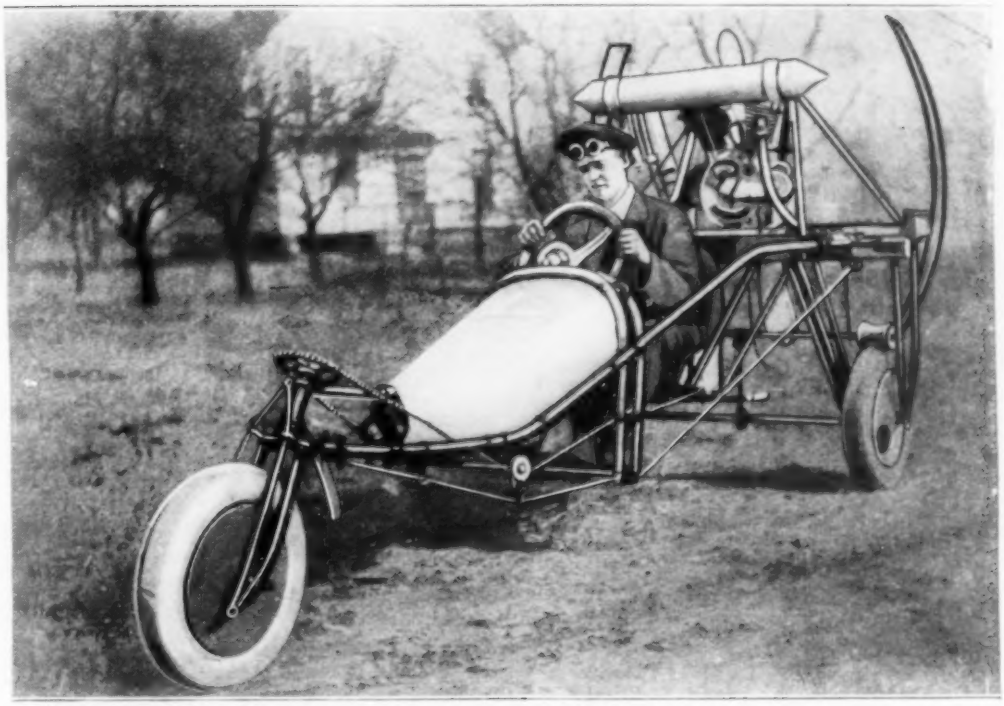
## HANDY MACHINE FOR TESTING RIPENESS OF PEARS

Because the juicy pears that one buys from the grocer or fruit stand must be picked green and allowed to ripen, it is a difficult matter to tell just when the crop is ready to harvest, as the green pears are extremely hard. A simple testing machine has now been devised, consisting of a scale, plunger, and handle, by which the exact hardness of the fruit may be gauged. Selected samples of the crop are tested from time to time by pressing the plunger and noting the force required to dent the fruit, and thus the fruit can be picked at the proper time to insure its reaching the market in prime condition.



By Pressing the Plunger Down on the Sample of Fruit on the Scale and Noting the Force Required to Make a Dent, Its Exact Hardness can be Gauged

After being picked, the fruit is allowed to stand six hours before testing.



This Little Aeromobile is Constructed Almost Entirely of Airplane Parts, and, Driven by a Motorcycle Engine and Propeller, Makes Good Speed over Smooth Roads, Using Little Gasoline

## NEAT AEROMOBILE IS DRIVEN BY MOTORCYCLE ENGINE

What appears, at first glance, to be an airplane without wings, is, in reality, a road vehicle driven by a motorcycle engine and propeller. Airplane parts have been used for nearly all of the construction, and on smooth roads the little machine is capable of good speed. Braking is accomplished through two hardwood reels that are pressed against the two rear wheels. The construction, while light, is strong, and the machine has stood severe tests over rough country roads.

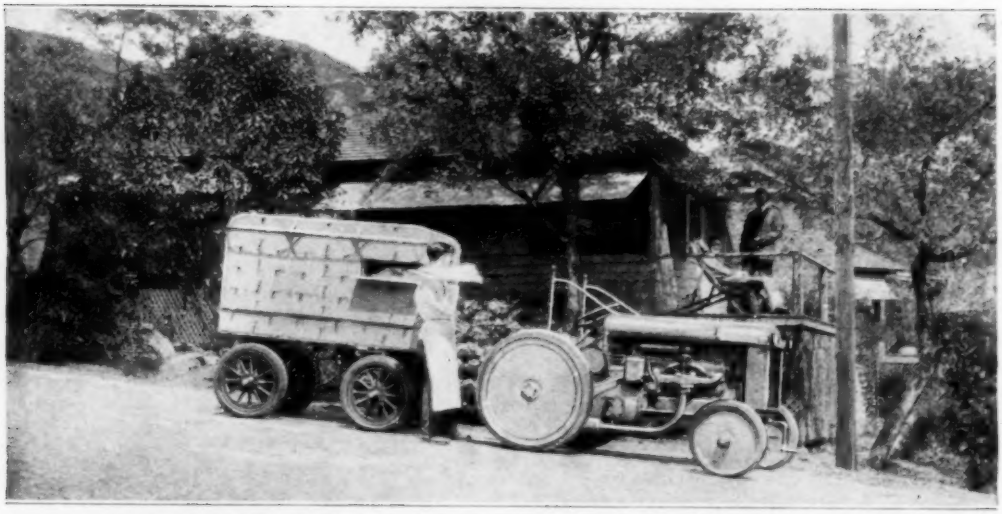
## VOICES REGISTERED ON FILM FOR SPEAKING MOVIES

Registering voices simultaneously with the action of a motion-picture film is an invention recently announced by Lee De Forest, pioneer in the wireless research field. The voice, according to the inventor, is registered on the narrow margin of the film by light action, the margin thus bearing a veritable picture of the vocal effort. Through the medium of a special attachment on the projection machines, the spoken words are reproduced in synchronism with the motion picture.

## NEW HAWAIIAN GUITAR RESTS FIRMLY ON PLAYER'S LAP

A new musical instrument bearing some resemblance to a zither and played like a Hawaiian guitar has been devised by a young woman of Honolulu. The hollow sound box extends under the entire length of the strings, and the lower surface is shaped to rest securely across the lap of the player.

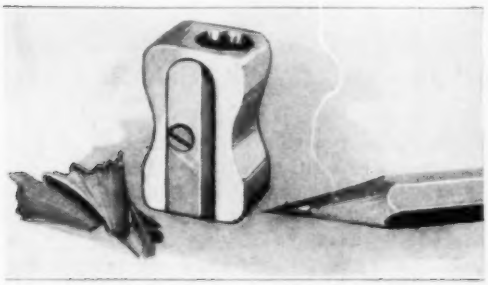
The Hollow Sound Box of This New Musical Instrument Extends under the Full Length of the Strings, and Fits the Lap of the Player



Tractor-Trailer Outfit Which is Used to Haul Steaming-Hot Meals to the Patients at a Tuberculosis Sanitarium: With This Outfit, All the Meals are Delivered to the Inmates of the Widely Scattered Bungalows by the Employment of a Driver for the Tractor, and One Waiter Who Carries in the Trays

## PENCIL SHARPENER PRODUCED WITH TOOL-STEEL BLADE

Simplicity of design and practical arrangement for being kept in good condition, are the chief merits of a pencil



Pencil Sharpener with Tool-Steel Blade: The Shavings and the Sharpened Pencil Are Evidences of the Keen-Cutting Edge

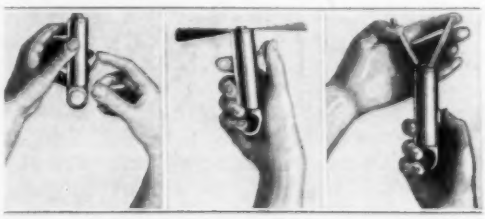
sharpener made in Germany. The appliance is 1 by ½ by ⅜ in. in size, easily fitting into a vest pocket or handbag, and has a renewable, tool-steel cutting blade.

## WARM MEALS FOR PATIENTS HAULED BY TRACTOR

Steaming-hot meals are carried three times each day to the patients at a tuberculosis sanitarium in California, the delivery being made with a tractor-trailer outfit. This plan was inaugurated as a means of preventing the mingling of the inmates, who are accordingly housed in separate bungalows which are scattered over a large area. The outfit consists of a small-size tractor engine mounted on rubber tires, and three trailers of special design, and likewise fitted with rubber tires. The trailers are virtually all-metal cupboards, equipped with tiers of shelves for holding the trays, each of which has an individual door. Steampipes are installed throughout the interior of the trailers, with a valve at the rear whereby a connection is made with the kitchen heating plant while the trays are being placed in the queer conveyance.

## DIMINUTIVE REVOLVING FAN OPERATED BY HAND

Diminutive revolving fans, operated by hand, are the latest novelty, and are now being manufactured and placed on the market by a Chicago company. In using this toy, the blades are caused to revolve rapidly by means of a trigger arrangement, worked by the thumb. When not in use, the blades are folded and concealed in the case, which is small enough to be carried conveniently in a vest pocket or a handbag.



Left: Diminutive Revolving Fan Inclosed in Case. Center: Blades Out and Thumb on Trigger Ready for Use. Right: Fan being Closed

## SEMAPHORES ON INTERURBAN OPERATED BY PUBLIC

Seeking to eliminate all danger and give the public better service, an electric railway in Michigan has installed semaphores on all of its small crossroads stations. An ordinary light bulb is constantly burning at these places, and serves for illumination when not used for signaling purposes. When the would-be passenger arrives at one of these stations, he waits until the car approaches and then pulls a wire which places the green-disked semaphore in front of the lamp. Since the inauguration of this system, the company claims to have had fewer accidents, and also a greater amount of praise from its patrons.

Semaphore on Interurban Station Which is Operated by Would-Be Passenger Pulling a Wire

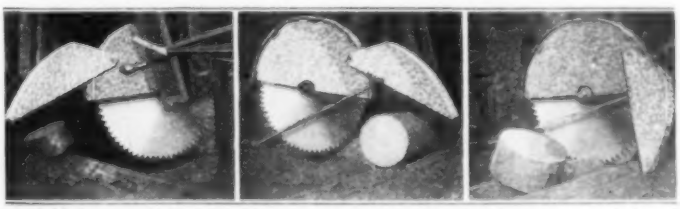
## TOBACCO-GATHERING MACHINE SAVES HAND LABOR

Tobacco-Gathering Machine That Strips the Leaves from the Lath When It is Inserted in the Hole Seen above the Table

In curing tobacco, the leaves are strung in bundles along wooden strips or lath, which are hung in the drying sheds, and a machine has now been designed for gathering the strips from the lath rapidly, when the curing process is complete. Behind a table is a vertical frame in which are mounted two pulleys which are rotated by a gasoline engine beside the frame. In the frame in front of the pulleys is a small hole through which the lath is fed between the pulleys, which pull it through the hole, pushing off the tobacco.

## AUTOMATIC SAFEGUARD OPERATES WITH SWING SAW

A novel safeguard for a swing saw, in use at a New York factory, consists of an automatic guard for the front of the saw that incloses that part of the saw after it has passed through the sawn material. In connection with this guard is a rod that prevents the saw from moving any farther forward, after it has done its work. When the saw is swung backward, this movement is limited to the proper position by a stop, and in connection with this is a latch that automatically prevents the saw from moving forward while material is being placed in position for sawing. A light on the saw illuminates the cutting edge, and a counterweight transmits cutting pressure to the saw.



Left: Swing Saw in Its Backward Position, with Automatic Guard Raised Ready for Cutting. Center: Other Side of Saw, Showing Rod That Actuates the Guard. Right: Position of Guard after Saw is Moved Forward

## SPARE-TIRE CARRIER LIFTS HEAVY METAL WHEELS

Lifting heavy wheels containing spare tires, from the ground to the carrier, is a difficult task for a woman, and to lighten this effort an extra-tire carrier has been produced which has a lever attachment.

Left: Lever Attachment being Applied to the Spare-Tire Carrier Preparatory to Lowering the Heavy Wheel to the Ground. Right: Ready to Roll the Wheel Around to the Front of the Automobile

This lever is fitted to the center of the carrier, with the handle projecting through the wheel. The spare member is then easily lowered to the ground and the damaged wheel put in its place, all of which is executed with but a minimum of exertion.

## STOPPING SUCK-HOLE LEAKAGE IN ROCK-FILLED DAMS

Enormous losses in water power are readily evident in many sections of the country during dry seasons. In some cases the trouble has been traced, after many attempts to locate sources of water loss at dams, to the presence of so-called suck holes, sometimes far removed from the dam itself and the sheeting adjacent thereto.

As these losses were confined principally to plants where the rock-filled type of dam was used, or dams without deep foundations, methods had to be devised not only to trace underground leaks but to remedy them. Such leaks may, in time, form a regular subterranean tunnel and drain great quantities of water.

The methods of locating these suck holes and filling them without employing costly diving apparatus are interesting. Two men in a boat, hitched to a cross-river rope, work their way back and forth from one bank to the other. For the exploration work, the boat is equipped with an electric light of about 200 watts. The lamp, incased in a waterproof marine socket, is lowered from one side of the boat until it nearly touches the river bed. The man on the other side of the boat watches, through a marine telescope, for traces of eddy currents. The process is continued until the entire area above the dam has been explored. After the leak is found, it remains to determine its shape and size. The material used for filling the hole depends on the size of the subterranean tunnel. For small channels, small field stones or small bowlders are sufficient. In larger tunnels it becomes necessary to lower sacks of cinders and sometimes concrete into the orifice.

The best and most permanent method of stopping these leaks is to first let down small stones, loaded in tin cans, and, if necessary, force brush and other objects into the opening, until observation determines that the obstructions are actually lessening the flow. A few sacks of cement or cinders on top of these will finally eliminate the suction. The whole should finally be sealed over with a 2 or 3-ft. covering of concrete, spread over an area of at least twice that of the leak.

## NOW OPERATE PRAYER WHEELS IN INDIA BY ELECTRICITY

Motor-driven prayers have become popular with the Buddhist priests of Simla, the summer capital of India. Formerly the limit of invention allowed lazy priests to tack pieces of paper, on which were written the perpetual prayers, onto great prayer wheels. The power for turning these wheels was supplied from the many small mountain streams about the capital. When a firm of British engineers came with a proposal to divert these little streams and merge them into a water-power project, the priests incited the people against them until finally an item was included in the franchise stating that electric motors and power were to be supplied to perpetually turn the prayer wheels.

Bringing the "Wild Men" Ashore: These Men Are Members of the Tribe Giving the "Potlatch," and are Dressed in Masks and Costumes. After the Guests are Seated at the Feast, the Wild Men Entertain Them with Dances

# PACIFIC-COAST INDIANS FIGHTING TO RETAIN ANCIENT RIGHTS

By FRANCIS DICKIE

ONE of the most unusual legal battles in Canadian history has just been staged on the Pacific coast of British Columbia, where some forty of the Kwakiutl tribe have been convicted of holding a "potlatch," and some of them sentenced to two months' imprisonment. Among those convicted was a squaw, the first in the history of British Columbia.

In defense of their ancient primitive rights, the Indians hired the best legal talent obtainable in the country, and though the Court of Appeal decided against them, the Indians are continuing the fight by way of a petition to the Governor-General, Lord Byng, and Council, asking that the law against the potlatch be modified. Though the fight has largely centered around a few members of the Kwakiutl tribe at the famous Indian village of Alert Bay, all the coastal Indians are affected by the enforcing of the law, as the potlatch feast is one of the most important things in the social organization of all the coast tribes of British Columbia and also Alaska; a social organization vastly complex, and understood by very few white men. Those few white men fully conversant with the social organization of the Indians are mostly in sympathy with the red men, and a good many to date have put their signatures to the petition.

The writer of this has given considerable time and study to the Pacific-coast Indians, traveling on various occasions in many regions with a member of the anthropological department of the Geological Survey of Canada, and getting as thorough an insight into the social organization, myth, and legend of the various tribes as is possible, short of a lifetime of research.

The potlatch is one of the outstanding events of life among the Indians of the Pacific coast, but very little has been written of it, and this mostly without understanding of the deep social significance of the feast, dancing, ceremonies, and gift-giving which are a part of the event called potlatch.

On the part of the government, a law against the holding of potlatches was passed in 1884 (Statutes of Canada, Chapter 27, Section 3). But the Indians continued their ancient customs without prosecution, until 1897, when there was, as far as I can find, only one prosecution, the Indian not defending himself. In 1918 the law was amended so Indians could be tried by the Indian agent. Since then numerous prosecutions have been made and many convictions have been registered against the Indians, ending with the prosecution of no less than forty in the first months of 1922. The fight was centered mostly around the famous Indian village of Alert Bay, once the most picturesque

of its kind in North America, with its wonderful collection of totem poles and immense potlatch houses, but now, due largely to the interference of white men, losing its ancient charm. In the first week in March, 1922, the last of the magnificent totem poles were sold—a rare thing for Indians to do. Two of the poles went to Portland where they will figure in a coming exposition, and the third to the "historic Indian village" that is being erected in Stanley Park, Vancouver.

The government's placing restraining laws against the holding of potlatches was on the ground that Indians on these occasions impoverished themselves by giving away all their earthly possessions, often the savings of years; for when an Indian gave a potlatch, he did give away everything he owned to members of his tribe whom he had invited. In some cases, where a very great chief gave a potlatch, people of other tribes, often hundreds of miles away, were invited. In the years before the white man came, such feasts lasted from ten days to a month.

**At This Potlatch Given at Alert Bay, British Columbia, Kitchen Utensils and Furs were Given Away. The View Shows the Gifts Displayed for Inspection**

But though the government was partly right in its claim, the potlatch presents a paradoxical situation, for in giving away all he possessed an Indian was at the same time acquiring a vested interest—the potlatch was nothing less than a life-insurance premium, old-age pension, and endowment fund all rolled into one. In fact, the Indians had in operation a mutual-benefit system long before the white man.

Within the limited space permitted a magazine article, the best way to set forth the unique and peculiar workings of the Indian system which centered around the potlatch will be to tell of one, and the events leading up to it. From the many tales of such familiar to the writer, the story of Saix, a famous Tsimshian chief living a hundred and fifty years ago, is given as perhaps being the best example.

One day Saix, while walking to his canoe, slipped and fell. On arising, he noted that his accident had been witnessed by two other chiefs. Now, though this was an unavoidable accident, he was still, in the Indian way of thinking, "subjected to ridicule" by these men having witnessed his fall. To wipe it out, a feast had to be given some months later, as soon as preparation could be made. At this feast were the two chiefs and most of the others from the region, and the headmen of the tribe. The feast, or potlatch, the correct term for which is "yowk," was of lesser importance, only food being given away. But every guest was given far more than he could eat, so that much was carried away. The food presents consisted of cedar boxes filled with eulachon grease, bags of berries preserved in eulachon grease, dried salmon, pressed cakes of seaweed a foot long, dried deer meat, and herring eggs on kelp, a prime delicacy; dried salmon was the pièce de résistance.

Shortly following this feast Saix' nephew reached an age when he could assume his name in the tribe. The Indian descent is maternal, so a man gives more attention to his nephews and nieces than to his own children, and they in turn aid him in any undertaking such as a preparation for a feast. Thus Saix, when he gave his food feast, was assisted by his brothers, nephews, and nieces. He did not have to repay this, except that he was in duty bound to serve any of the helpers in the same way if he should ever be called upon to do so. Similarly, his maternal relatives helped him prepare for the feast which celebrated the nephew taking his name as a member of the house. This last feast was of great importance and had been prepared for several years in advance. All the chiefs and headmen of the region were there. As they filed into the great house

Above: Sewing Machines, Furniture, and Dresses were Given Away at This Potlatch, Where the Gift-Giving Was Lavish

of Saix some of Saix' relatives saw them seated in order of rank, a very important thing, a mistake being the most serious slight that could be offered. Following this, "wild men" in masks and costumes danced, and singers related in chants the heraldic feats of the Saix clan.

Left: A Kitchen-Utensils Potlatch. The Totem Pole Shows by Symbols Various Feats of Skill Performed by One Tribe

Then Saix gave away some 300 furs of otter, beaver, mink, and marten; two great dugouts of cedar, and two copper shields, these last the most important item of wealth in coast Indian history. The copper shields were first made of the raw copper beaten out by Coppermine

At a Shoes and Clothes Potlatch: Enormous Quantities are Given Away to the Guests, the Givers Often Making Themselves and Members of Their Family Bankrupt in Their Efforts to Excel All Previous Potlatches, Preparations Sometimes Going Forward for a Period of Three or Four Years

Indians nearly 1,500 miles away, and by various bartering tribes were passed on to coast Indians. Later the Hudson's Bay Company, getting wise to the enormous valuation placed upon them by Indians, began manufacturing them at Victoria about 1815. Turned out, they cost about $2. Recently one was sold for $10,000 by one Indian to another, though only $1,400 was made as a first payment. The shield was worth only about $2 in white man's money, but it represented some vested interest, in the Indian social organization, of sufficient value to make its acquiring worth while to the purchaser.

At any rate, at the Saix feast this abundance of wealth was given away. During this and the previous feast, at which some twenty of Saix' maternal relations were present, these relations kept track of everything given. In the weeks and months following the feast they often talked the facts over to keep fresh in mind all that had been given and to whom, both of food and more expensive things; for every one of these gifts had to be repaid, doublefold, by the person accepting them. In the case of great chiefs, the gifts were often returned four and fivefold. The laws regulating all the bases of return are too intricate and would require too much space to give in detail. Suffice it that Saix now had a nice little income due him, of food, furs, canoes, and coppers. The feasts were usually returned within three years' time at the outside. Should any guest fail in due time to return the feast, Saix and his relatives would then subject him to ridicule by spreading tales of his poverty, the worst insult possible to give an Indian of the coastal regions. Seldom did a man fail to return a feast and repay doubly or trebly, or fivefold, the things received. In instances where he was unable, through lack of hunting, fishing, or ability in war, to get the wherewithal to repay, the man would be so subjected to ridicule he would leave the tribe.

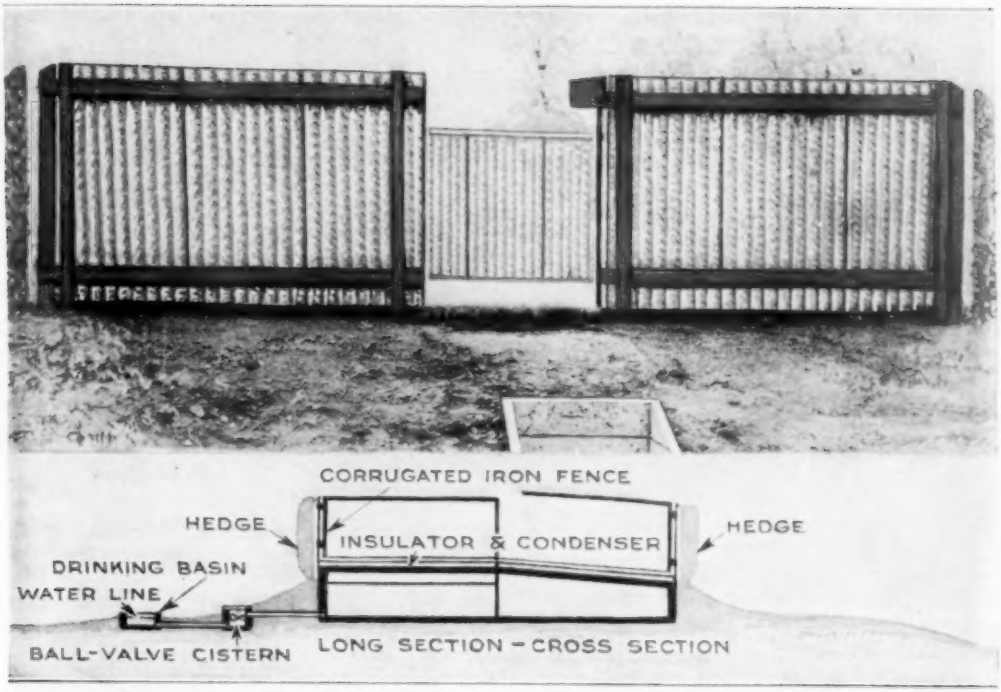
Now, in the instance of Saix (to show the working out of this mutual-benefit system), shortly after the last feast he fell sick and was unable to hunt for over a year. Yet he and his family were fully supplied with food by reason of all the food coming in at various feasts given him by way of return for the one he had given. Similarly he began to get returns on his second feast in the way of furs, etc. But Saix died about a year after the giving of the last feast. However, unlike the white man's way, where death usually wipes out personal obligations, Saix' income from the feasts did not stop, but had to be repaid to his nephew.

After the coming of the white man, the potlatches changed considerably. Instead of furs the Indians began giving blankets, flour, guns, and ammunition bought from the Hudson's Bay Company. As time went on they took full advantage of all the wonders of the white man, so in recent years potlatches have presented one of the most incongruous sights perhaps the world has ever seen. There came into existence sewing-machine, and furniture, and gramophone potlatches; potlatches of cooking utensils and clothes; boots and clothes; frequently furs and some of these articles. But the chief potlatches in recent times have been gramophone, furniture, and utensils. The writer has been fortunate in obtaining the most recent photos of what may be perhaps the last potlatches ever held. These photos also show the march of the wild men to the great ceremonial hall.

Should the potlatches be stopped forever it is hard to foretell what will be the effect on the Indians. It is a fact that quite aside from the vested interest acquired by giving a potlatch, the giving of such gave the giver immense prestige. It was the highest peak of social ambition for a coast Indian, striven for as eagerly as a nouveau riche trying to break into New York's "four hundred." Looked at from this point of view, the taking away of it may rob the Indians of initiative and ambition to earn money to hold one—another paradox in view of the government passing a prohibitive law because the potlatch impoverished the giver.

## DRINKING WATER FOR CATTLE OBTAINED FROM DEW

For collecting a supply of drinking water for cattle, a catch basin that takes advantage of the dewfall as well as the rainfall, thus greatly increasing the supply, has been constructed on a farm in England. That it really is a dew reservoir, and not merely a rain catcher, is proved by the fact that it collects more than twice as much water, by actual measurement, as it could by the rainfall alone. The dew in England is heavier than in most parts of this country, and the results here would not be so great as indicated in a dew reservoir built in England, that was 30 ft. square, and that collected an average daily supply of 120 gal. during the




**Above: Dew Reservoir Seen through the Opening in the Fence That Surrounds It. Below, the Reservoir is Shown in Section, the Left Half Longitudinally and the Right Half Transversely. The Reservoir Is 30 Feet Square and Five Feet Deep, and the Corrugated Iron Fence Is Eight Feet High**

hot summer months, and 50 gal. daily during the rest of the year.

The dew reservoir consists of a concrete cistern about 5 ft. deep, built upon the surface of the ground and having a sloping roof, which acts as an insulator and condenser. The sides of the cistern are banked with earth up to the roof, and above this the whole is inclosed with a corrugated iron fence about 8 ft. high, which aids in collecting the vapor and shields it from the wind. This fence is made still more effective by surrounding it with a hedge. A pipe conducts the drainage from the low part of the roof into the interior of the cistern. To one side at a lower level is a concrete drinking basin, into which the water is piped after passing through a small container where a ball valve controls the supply.

## DEVICE CHANGES KETTLEDRUM TO MUSICAL INSTRUMENT

The demand for new musical sounds in the "jazz" orchestra has led to the development of a device that permits the rapid tuning of the kettledrum to a point where it ranks as a musical instrument. All the tuning handles are connected by a shaft with universal joints, and this shaft is, in turn, connected to a pedal wheel by which the drummer raises or lowers the

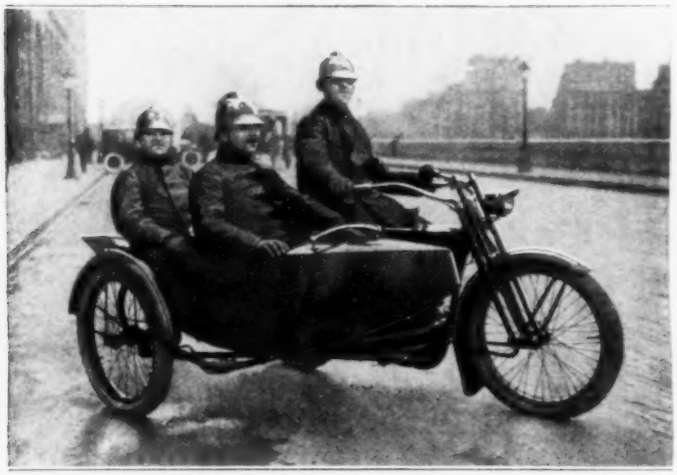
**By Turning the Pedal Wheel of This Device, the Drummer Turns All the Tuning Handles, and Changes Rapidly the Pitch of the Drum**

pitch of the drum by changing the tension of the head.

¶ Yellow taillights may replace those of the usual red hue, the advisability of the plan now being under consideration by the Society of Automotive Engineers, who claim that confusion of these with the red warning signals used on highways has resulted in many serious accidents.

## SPECIAL FIRE-FIGHTING UNIT SPEEDS ON MOTORCYCLE

Because of the ease with which it can be driven through the heavy traffic of Paris streets, the fire department of that city has adopted a special motorcycle unit for use in fighting small fires. A motorcycle and sidecar are used and the crew consists of three firemen. A box mounted behind the driver contains extinguishers and other necessary tools.



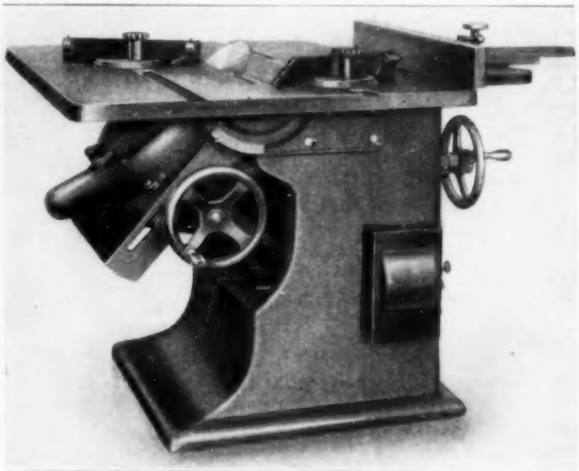
This Special Unit is Used by the Paris Fire Department for Fighting Small Fires, Because It can Make Better Speed through the Heavy Traffic When Responding to an Alarm

## TECHNICAL SCHOOL IN INDIA FOR APPRENTICES

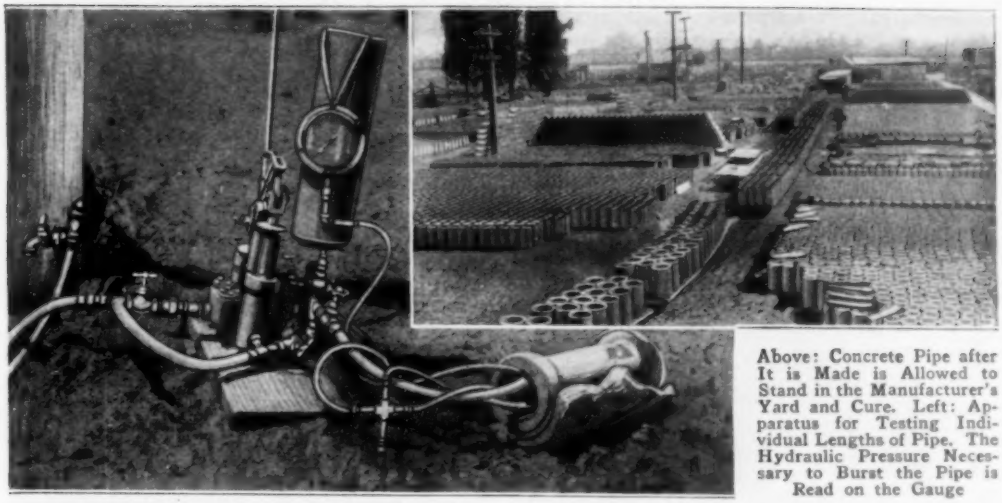
As the result of the recommendations contained in a report of a committee appointed in 1919 by the Bengal government in connection with the establishment, in Calcutta, of a part-time technical school for apprentices, a piece of land, several acres in area, has been purchased at a cost of about $250,000, as a site for the erection of a school building. As soon as the ground has been cleared, the first story of what will eventually be a three-story building, will be completed, and will be used as a school, pending the completion of the upper stories. This temporary school will accommodate about 300 apprentices, and during its erection about that number, both European and native, will receive part-time training at the Calcutta Evening Technical School, which receives a yearly grant from the Indian government. The government allows free use of rooms in the School of Art for these classes.

## TILTING ARBOR SAW BENCH DIRECT MOTOR DRIVEN

A tilting arbor saw bench with the saw at an angle of 45 degrees, and with direct motor drive, is now on the market. The saw operates in a slot in the table, 38 by 47 in. in size, the underside of which is ribbed to eliminate all possibility of warping. The machine is equipped with ball bearings in well-lubricated housings. The base of the machine is a one-piece casting in pedestal form, in which all the working parts are inclosed in such a manner that the sawdust cannot reach them. In connection with the base is a yoke that supports a sliding bracket on which the motor is mounted, and that has means for its adjustment. Fully graduated gauges are provided as well as a splitter guard that covers the rear half of the saw, which is inclosed in a dust spout furnished with a door. The motor is controlled by an inclosed safety switch on the outside of the housing.



Tilting Arbor Saw Bench with Direct Motor Drive, and Saw at an Angle of 45 Degrees: Motor on Bracket at Left Is Adjustable



Above: Concrete Pipe after It is Made is Allowed to Stand in the Manufacturer's Yard and Cure. Left: Apparatus for Testing Individual Lengths of Pipe. The Hydraulic Pressure Necessary to Burst the Pipe is Read on the Gauge

## STANDARDIZATION OF METHODS IMPROVES CONCRETE PIPE

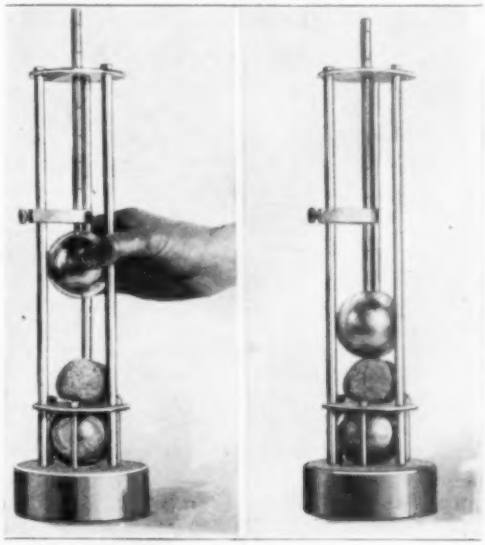
Because, in many localities, concrete pipe, when properly made, cured, and laid, is more economical and durable than other forms, investigations have been made to determine the best methods of manufacture. One result of this investigation has been the development of a device for testing individual lengths of pipe without the use of bulkheads, joints, and connecting rods. The tester consists of an aluminum cylinder supplied with rubber tubes near the ends for making a tight joint. The tester is inserted in the pipe, and water pressure in the tubes seals the joints, and is then increased until the pipe is broken. Other tests are also made and have resulted in the standardization of manufacturing methods, thereby producing a concrete pipe of materially better qualities.

## LONG STEEL COLUMNS EFFECT SAVING IN BUILDING

In the erection of a five-story office building in California recently, the use of long steel columns above the second floor resulted in a considerable saving in the time of erection. The columns used were standard commercial 60-ft. lengths, and while heavier than necessary for the upper stories, the extra cost was offset by the saving in shop cost and erecting time. Another advantage of the use of long columns is that it eliminates the necessity of repeated raisings of the lifting derrick.

## NEW DEVICE TESTS HARDNESS OF ROAD-BUILDING GRAVEL

To aid local contractors in determining the suitability of gravel for road-building purposes, a portable testing apparatus has been designed by which the hardness may readily be gauged. The specimen of gravel to be tested is supported on a steel ball, and another steel ball is allowed to fall upon it from varying heights. The movable ball is supplied with a scale for recording the height of fall necessary to



In This Hardness-Testing Device, the Movable Steel Ball Falls on the Sample Supported on Another Steel Ball, and the Height of Fall is Shown by the Scale

fracture the sample and thus determine its ability to withstand traffic conditions.

## LONG-HANDLED CHISEL USED AS TREE-PRUNING TOOL

Trimming the small branches from trees can be easily and rapidly accomplished by using a long-handled chisel,

Tree-Pruning Chisel Which can be Fitted with a Long Handle, Thus Enabling the Workman to Trim Small Trees without a Ladder

which is the product of an eastern orchard owner. The chisel, a keen-edged blade affixed to the end of a pole having a plunger attachment, is first placed against the limb to be cut off. The plunger is then drawn back to its full extent and driven sharply forward, hitting a "cushion" of sole leather, the impact forcing the sharp tool through the branch.

## CHEMICAL INSTANT-HEAT BAG FOR MANY PURPOSES

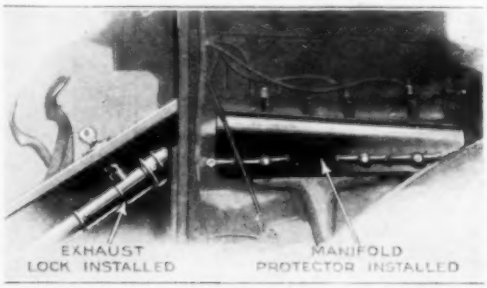
The well-known fact that certain chemicals give off heat when moistened with water has been put to practical use in the development of a heat bag recently introduced. Certain harmless chemicals are placed in a bag of heavy canvas, about the size of the regulation hot-water bottle, and when it is desired to heat the bag, it is only necessary to pour an ounce of water into the bag and the chemical action immediately starts. Either hot or cold water may be used and the amount of chemicals in the bag would about fill an ordinary drinking glass. The heat generated is moist and nonirritating, and a temperature of 200° F. is attained.

The addition of water will cause heat to be generated for a period of several hours. If further heat is required, more water may be added until the heat-generating properties of the chemicals are exhausted. One charging of chemicals will produce about 200 hours of heating effect, and fresh chemicals may be secured at nominal cost.

When an Ounce of Water is Poured on the Chemicals in This Bag, Heat is Generated. This Heat will Last for Several Hours and can be Renewed

## AN AUTO LOCK THAT CLOSES THE EXHAUST PASSAGE

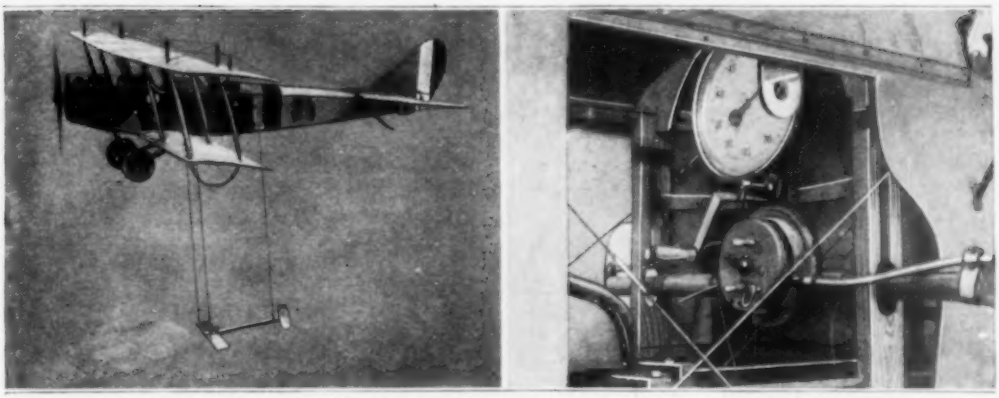
Brought out specially for a well-known small car, but applicable to any car, an auto lock has been devised which prevents the operation of the engine. A butterfly valve is inserted in the exhaust pipe and connected with a lock set flush with the floor boards. When the lock is closed, there is no vent for the exhaust gases, and the engine will not run.




This Auto Lock Sets Flush with the Floor Boards and Closes a Butterfly Valve in the Exhaust Pipe

## TO DEVELOP IRON RESOURCES BY STEEL PLANT IN AFRICA

In the effort to reduce the large imports of steel and steel products into South Africa, it is proposed to erect a steel plant there, capable of supplying a substantial portion of the local demand. Investigation has shown that there are important deposits of first-class iron ore and an abundance of coal located within a reasonable distance of each other. Ore reserves sufficient for fifty to sixty years have been proved.



Left: When the Airplane has Reached a Proper Altitude, the Test Wing is Lowered on Three Wires and Its Behavior Noted. Right: The Winch and Recording Apparatus are Located in the Fuselage of the Airplane

## METHOD OF TESTING AIRPLANE WINGS BY FLYING IN AIR

The fact that wind tunnels and other means of testing small models of airplane wings have not given dependable results, has led to the development of a method of testing large-size wings under actual flight conditions. A wing is suspended in an inverted position below an airplane that is capable of flying at a speed of 75 to 100 miles per hour. When the airplane has reached a sufficient altitude, the test wing is lowered about 25 ft. on three steel wires, and instruments in the cockpit of the testing plane record the reactions of the test wing at different speeds, altitudes, and angles of incidence. Before landing, the test wing is reeled up, clear of the landing gear, directly below the testing plane. By this method of testing, any defects can be noted under actual flying conditions and more dependable results obtained.

## EIGHTY POUNDS OF AMBERGRIS WORTH A SMALL FORTUNE

Ambergris is an ash-colored waxy substance found floating on the seas frequented by sperm whales, supposed to be an internal secretion from these animals. It is used in certain fragrant drugs and ointments, and is of great value. Recently, on the island of Hawaii, a lighthouse keeper while wandering on a lonely beach saw a mass of mysterious-looking white stuff floating some distance out at sea. He waited all day for it to be washed ashore. He picked it up, having no idea what it was, but imagining that it must be of some value, though never dreaming that it was worth about twice its weight in gold. It was, however, for although the whole of it weighed only 80 lb., its value was over 40,000 dollars.

Another man who found about 90 lb. of ambergris on the beach at Laysan Island, a few hundred miles from Hawaii, was not so fortunate. Judging from its appearance that it must be of some use, he took it to his shack and kept it there until one day when painting the shack, he ran short of oil, and thanked his stars that at last he had found some use for the waxy substance. He melted the ambergris, and finished the painting of his shack with a mixture that was worth about $45,000. It would have been more economical to have gilded the shack.

Piece of Ambergris Picked Up on the Beach on the Island of Hawaii, That Weighs Only about a Pound and Is Worth at Least 500 Dollars

¶By using a special dynamometer, the Bureau of Standards, among other things, has been able to determine the power loss in automobile tires. It was found that an average 4-in. fabric tire under normal conditions will absorb .90 hp., due to rolling resistance at a speed of 25 miles per hour.

## ELECTRIC ALARM KILLS MAN BY EXCESSIVE VOLTAGE

Argentine Workman Who was Electrocuted by His Alarm-Clock Arrangement While Sleeping: Wires Leading from the Light Circuit, by Way of the Clock, can be Seen on His Wrists

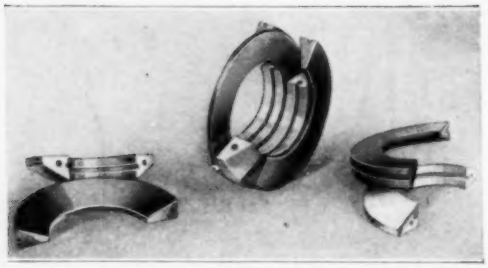
Combining electricity with an alarm clock as a means of rousing himself from sleep, was the idea of an Argentine workman in Buenos Aires. The clock, alone, failing to awaken the heavy sleeper, he had conceived the plan of connecting the electric-light circuit to his wrists, with wires. Then, when the predetermined time arrived, the turning of the alarm handle closed a contact, causing a current to pass through his body. For some little time the contrivance operated successfully, but one morning a defect in an outside line transformer permitted an excessive voltage to enter the residence wiring, killing the sleeper.

## EQUIP SEAPLANES WITH KITE TO CARRY RADIO ANTENNA

Because, heretofore, seaplanes have been equipped only with trailing antenna, it was possible for them to keep in radio communication with shore stations only when in flight, as the trailing antenna was useless after the plane had settled on the water. To remedy this condition, some planes have been equipped with small "fin antennæ," but their range is very limited. The practical solution seems to have been reached in using kites to carry aloft the antenna in case the plane is forced down. Canvas screens on the plane direct the wind stream from the propeller against the wind-driven radio generator. Using this system, the sending range from the water is even greater than when the plane is using the trailing antenna in flight.

If the Seaplane is Forced Down and Needs Assistance, the Kite Carries Aloft the Wireless Antenna, While the Wind Stream from the Propeller drives the Radio Generator

## METALLIC PACKING FOR USE IN STUFFING BOXES

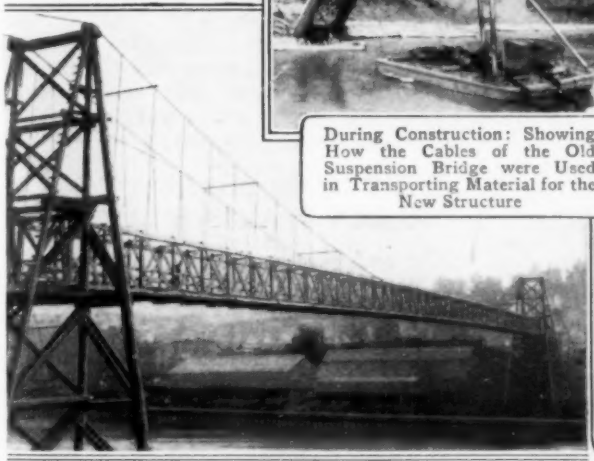


Metallic Packing for Stuffing Boxes, Consisting of Alternate Split Rings of Brass and Babbitt Metal of Wedge-Shaped Section That are Arranged in Pairs, Presenting Parallel Faces When Assembled

In order to overcome the annoyance of frequent replacements of the usual forms of packing used in the stuffing boxes of engines, an inventor has designed a metallic packing that, in trials, has given exceptionally good results. It consists of split rings of alternate brass and babbitt metal, so formed that when the gland nuts are drawn up, the babbitt metal rings are compressed against the piston rod. The ring segments are of wedge-shaped section, presenting parallel faces on opposite sides. This feature makes it possible to use as many ring sections as desired.

Above: As This Artistic Bridge will Appear When Completed. The Steel Work is Covered with Concrete as a Means of Protection and to Make It Harmonize with the Balance of the Structure

During Construction: Showing How the Cables of the Old Suspension Bridge were Used in Transporting Material for the New Structure



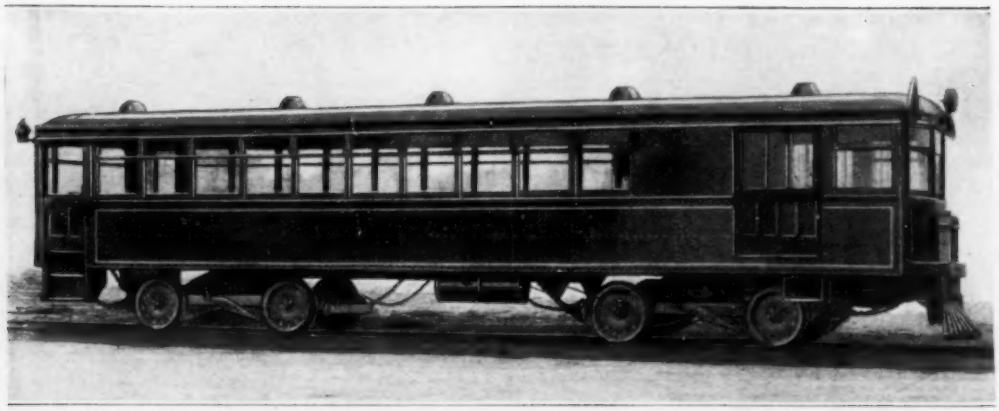
Left: This Temporary Suspension Bridge was Built to Accommodate Foot Traffic during Construction of the New Bridge. Right: Work Progressing on the Erection of the Main Arch That Has a Span of 350 Feet across the Willamette River

## LONG-SPAN CONCRETE-STEEL BRIDGE AT OREGON CITY

Construction is now well under way at Oregon City, Ore., on what is said to be the longest single-span bridge in the West. This bridge was briefly mentioned in the November, 1919, issue of this magazine at the time when its erection was first proposed. It will have a total length of 850 ft. with a central span of 350 ft. across the Willamette River. The immense steel girders forming the arch are now in place, and work is progressing on the superstructure. When completed, the bridge will have the appearance of solid concrete, as the steel frame will be covered with this material, not only as a means of protection, but in order that it may harmonize with the other parts of the structure, the whole blending with the naturally beautiful surroundings.

## KAOLIANG BRAN UTILIZED IN DYE MANUFACTURE

Kaoliang, or sorghum bran, is now being utilized in the manufacture of various dyes, principally black, brown, and blue-black. This bran may be obtained in practically unlimited quantities in Manchuria, where it is delivered at the railroad stations for approximately 1.80 yen (about 75c) per 100 kin (about 132 lb.). In the production of these dyes, the kaoliang product is mixed with soda, sulphate, and the like, for which process a patent has been granted.



Gasoline-Motor-Driven Coach with Seats for 44 Passengers and a Large Baggage Compartment: Its Weight Is 27,000 Pounds, and Its Maximum Speed 46 Miles an Hour. The Drive Is in Connection with the Front Truck

## GASOLINE-MOTOR-DRIVEN CAR FOR SHORT RAILWAY TRIPS

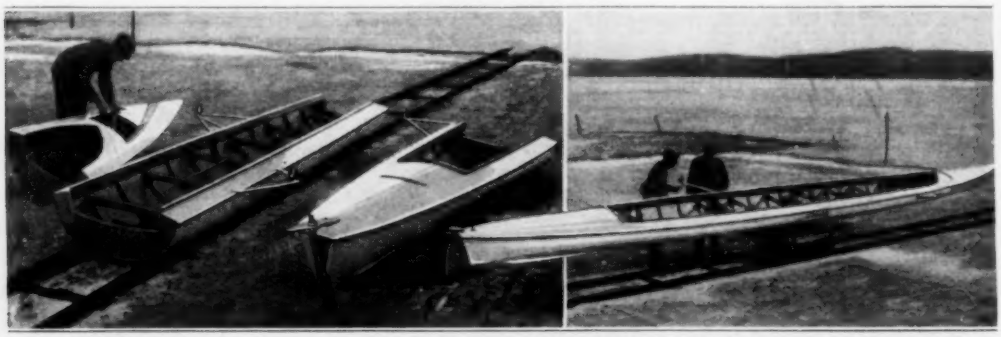
For short hauls on railroads, a gasoline-motor-driven coach, designed and built in Indiana, has met with much success, and gives promise of becoming the pattern for many cars of this type. The coach accommodates 44 passengers, and has a large baggage compartment. It weighs 27,000 lb., and has a maximum speed of 46 miles an hour. The motor and driving wheels are in connection with the front truck. In trial trips, it has made as much as 145 miles on 27½ gal. of gasoline and less than 1 qt. of oil. Thus, it averages over five miles per gallon of gasoline. The first coach built has attracted a great deal of attention from railroad officials in this country and Canada.

## ACETYLENE DOES NOT AFFECT CYANIDE SOLUTIONS

It has been supposed that acetylene acted as a precipitating agent when introduced into cyanide solutions containing silver, and, in fact, a patent had been granted for such a process. Recent investigations by the Bureau of Mines, however, have shown this to be a fallacy. It is not the acetylene that acts as the precipitant, but small quantities of hydrogen sulphide generated from the sulphur compounds which are present in the calcium carbide as impurities.

## BOAT IN THREE SECTIONS EASILY TRANSPORTABLE

Long and narrow, in appearance somewhat like an outrigged racing shell, is a boat built in three sections, which can be separated to facilitate transportation. The midship section is 10 ft. 6 in. long, and the bow and stern sections are each 7 ft. 6 in. long. The three sections can be put together in less than five minutes, and when disassembled, are easily packed for transportation. The boat has outrigged rowlocks, and stationary thwarts for the oarsmen. It has an ordinary rudder, but very little keel. It is light, and very neat in appearance.



Boat Made in Three Sections, Shown at Left Disassembled to Facilitate Its Transportation Overland: The Midship Section in the Center Is 10 Feet 6 Inches Long, and the Other Two Sections Are Each 7 Feet 6 Inches Long. Right: The Three Sections are Shown Assembled Ready to be Launched

## AUTOMATIC DEVICE REMOVES CRANKCASE-OIL DILUTION

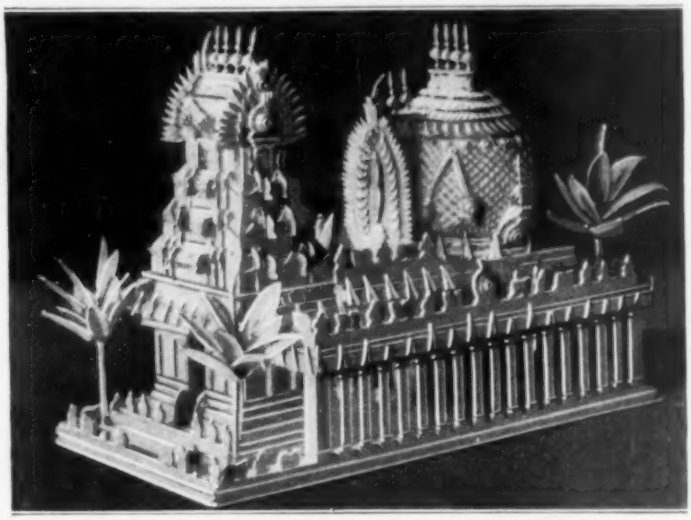
All autoists are painfully familiar with the trouble caused by the dilution of their crankcase oil with gasoline, and other matter from the motor cylinders. This dilution causes the mixing together of the heavy hydrocarbons of the lubricant with those of higher boiling point from the fuel. These two can be separated by heat, however. Upon this principle a method has been developed for automatically removing the gasoline and water dilution from crankcase oil, and filtering the sediment composed of carbon, sand, and metallic particles. This method removes all the present difficulties in the lubrication of internal-combustion engines. The apparatus consists of four main units: a heating element, a filter, a refiner, and a cooler. The entire outfit is very simple, light in weight, and occupies about the same space as a vacuum fuel system. It does not interfere with the existing lubricating system of the engine.

## TELEPHONE IS CAMOUFLAGED IN WALL OF CAFÉ

Camouflaging the telephone is a method used by the proprietor of a café in Los Angeles, Calif., to provide service at any time to those acquainted with the secret. The exterior of the building being of concrete blocks, an imitation block having a spring door has been made of wood. Persons familiar with the location of the counterfeit member can press a tiny button on its end and have the door swing open, exposing the instrument.

## MINIATURE MODEL OF SHRINE MADE BY HINDU MONKS

Time is a negligible quantity with a large portion of the population of India, and in some cases this condition leads to achievements that would be impossible in the western world, where universally time is money. A notable instance is a miniature reproduction of a Brahmanic shrine by Hindu monks, as a result of probably about ten years' labor. The model is perfect in all its elaborate details of columns, carvings, dome, steps, and palm trees. It is carved from a single piece of the bleached marrow of teakwood, which is soft and lends itself to delicate tracery. This wood is also extremely light, and the model weighs only 2 lb. 9 ounces.



Miniature Brahmanic Shrine, the Result of Many Years' Work by Hindu Monks: It Is All Hand-Carved Out of One Piece of Bleached Marrow of Teakwood, and Weighs Only Two and Three-Fourths Pounds

## MAKE TEST FLIGHT AT NIGHT ON CONTINENTAL ROUTE

In order to test the wireless and lighting arrangements on the air route between London and Paris, a flight was made recently, starting at about 9:30 p. m. and lasting until nearly midnight. The flight started from Croydon field, and a landing was made at Lympne field after a short flight off the coast, during which the aerial lighthouses on the French coast were easily distinguished. Leaving Lympne at 11:30, the fliers returned to Croydon, the lights along the route being readily picked out. It is thought there should be no difficulty in commercial night flying between London and Paris.

# TWO TYPES OF "CONCRETE LUMBER"

By FRANK B. HOWE

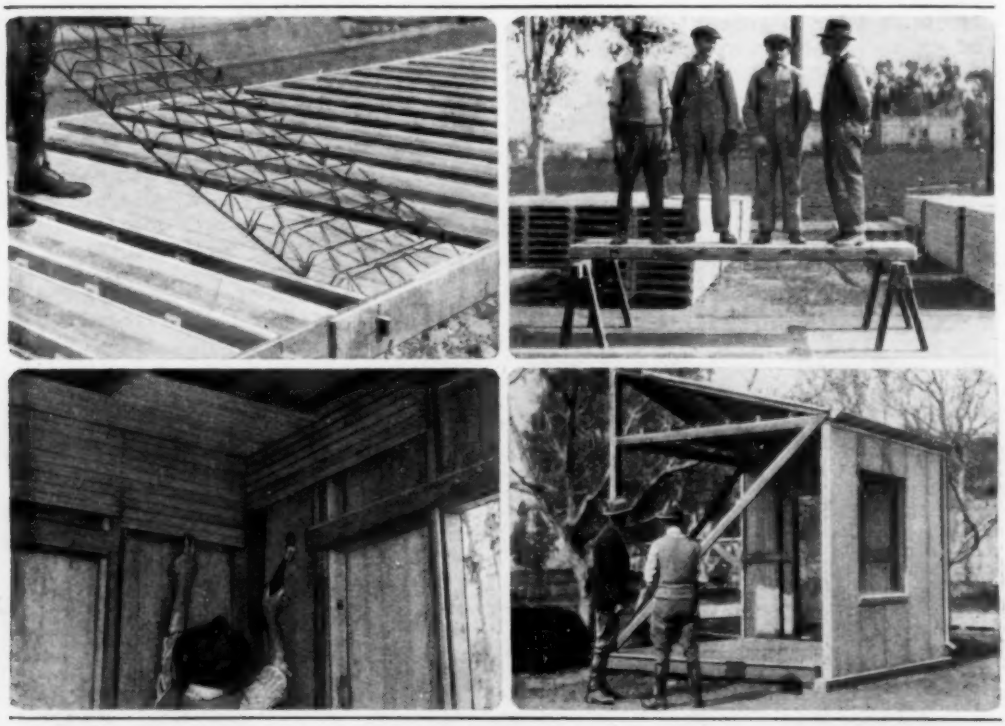
IT has commonly been predicted for some time that concrete as a building material would eventually take some form which would enable easier handling and faster construction than is possible under the customary method of handling that material at present.

Fully in line with this prediction, and with the peculiar coincidence which inventors in all lines know only too well, two men in the same city have announced at practically the same time the successful invention and use of what may be termed "concrete lumber"—material which may be purchased in the same manner as ordinary lumber; erected in similar fashion without need of elaborate forms or molds, and giving a finished result that equals that achieved by the pouring method.

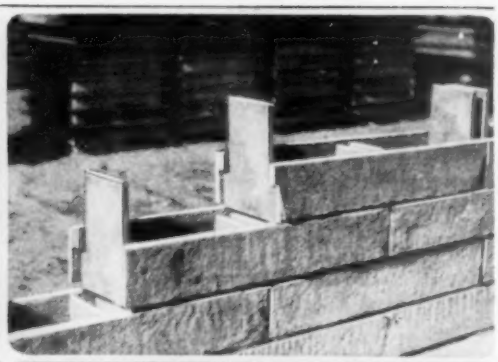
One style of this lumber consists of standard "boards" which are furnished in a variety of sizes. They are made by pouring concrete over special reinforcement consisting of iron rods and heavy-mesh wire. This is aged a little over a month before being sold. Hence when the purchaser buys it, he can erect his concrete building without the least delay. The boards are tongue-and-grooved and finished with a "beam" at each edge. In construction, these pieces fit snugly together, an iron clamp, or tie, is slipped around the adjoining beams, and the joint is made, a little wet cement having first been used to insure the absolute tightness of the connection.

To permit wooden inside finish, or lathing, and simple installation of wooden window casing and door frames, provision has been made for nailing wooden material directly into the concrete where so desired. The peculiar construction of the tongue-and-grooved joint enables one to drive a nail directly and without difficulty into the joint at any point. There is no danger of this forcing the joint apart. Thus, wooden or plaster finish can easily be applied.

Oddly enough, for supposedly brittle concrete, these boards are surprisingly resilient, owing to the nature of the reinforcing used. The inventor's pet demonstration of this quality of the material is to support a board on two horses and let men jump upon it, and while it gives as



These Concrete "Boards" are Reinforced with Special Wire Forms and Develop Great Strength, as Shown in the Upper Views. Because of the Shape of the Boards, Regulation Wooden Studding and Laths can be Used on the Interiors, the Nails being Driven into the Joints, as Shown in the Lower Views

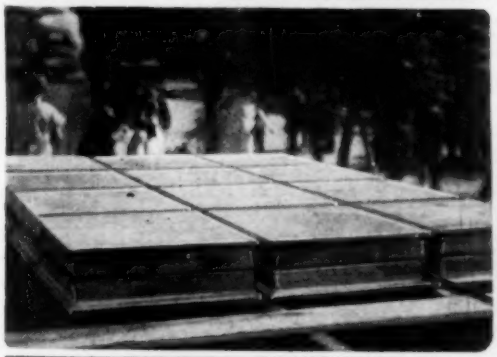


Three Views Showing a Form of "Concrete Lumber" in Which the Boards are Cast with Special Grooves in the Ends That Lock around Key Plates Set in the Wall: Built Up in This Way, the Wall Is Similar to Hollow Tile and is Then Washed Over with Wet Concrete That Joins the Boards into a Solid Wall

much as an inch under the force of the jump, no cracks have, so far, developed. Houses have already been built of this material and thoroughly tested, and have been satisfactory in every way. The wide air space in the wall, provided by lumber of this type, effectually prevents dampness.

The other type of concrete lumber has two basic types of construction—one for walls and one for floors. The wall type consists of small concrete boards, at the end of which are grooves, into which key plates, also of concrete, fit. In building up the wall, two of the boards are set parallel and about 6 in. apart, the ends are locked with the keys, and the following sections similarly added with the joints staggered. Wet concrete is then poured between the keys to bind the wall together.

The floor sections consist of square troughlike plates, which, when placed with



Illustrating a Type of Floor Construction in Which the Boxlike Concrete Blocks Rest on the Joists, Leaving Spaces between That are Filled with Wet Concrete, Forming a Solid Floor: A Floor 14 Feet Square Sustained a Weight of 100,000 Pounds without being Damaged, as Shown in the Lower View

their open sides together, form a hollow slab. The adjacent squares are laid 2 in. apart. A steel rod is then inserted in the opening and the space filled with concrete, solidifying the whole floor into one piece, and providing the necessary reinforcement. The strength of this type of construction has been demonstrated by a recent test, in which 100,000 lb. of cement were piled on one of these floors, which measured 14 ft. square, without caving it in. This type of concrete lumber has also been successfully used in actual construction and proved entirely practical, the floors showing good insulating properties due to the dead air space inclosed between the hollow slabs.

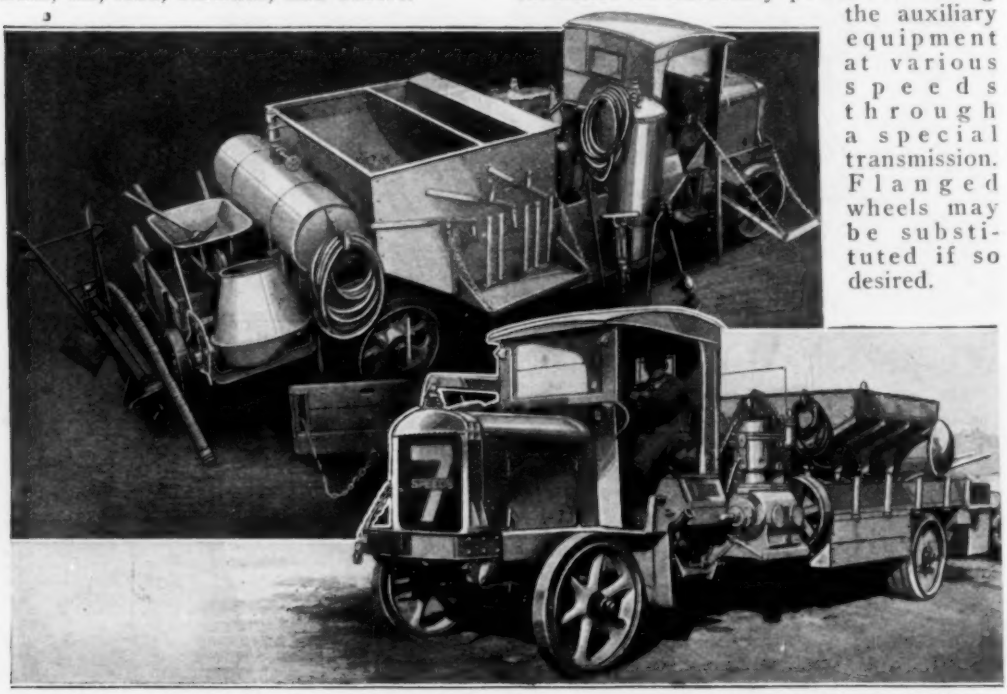
Probably these two systems are but forerunners of improvements and modifications that may eventually provide an ideal system under which the prospective builder will order his concrete building material in precisely the same way as he now orders lumber.

## DRAW FINE WIRES COMPOSED OF A SINGLE CRYSTAL

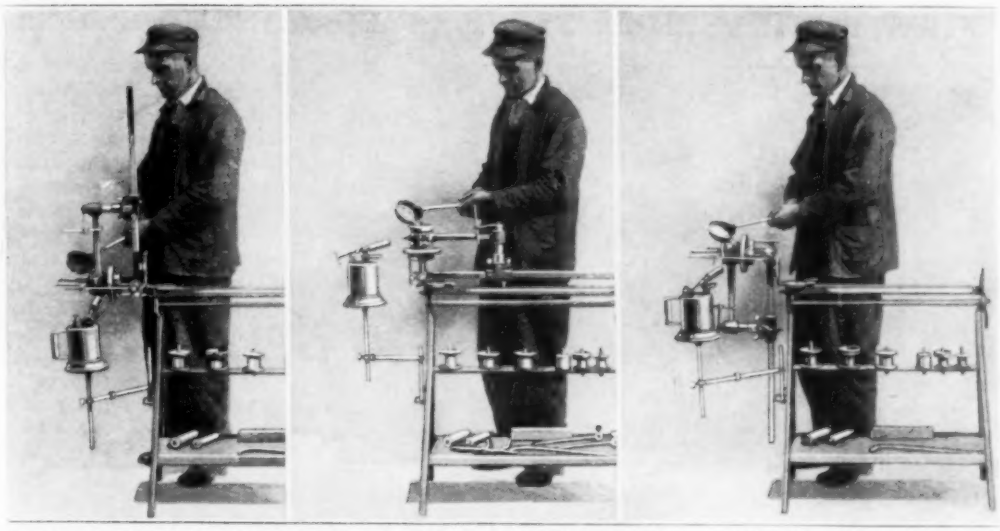
By means of a special drawing apparatus a foreign scientist has succeeded in producing fine metal wires that are believed to represent a single crystal of the metal. These single crystal wires have shown peculiar properties under tests. A zinc wire, drawn slowly, at a temperature 25 degrees above the melting point of the metal, has a ductility far above that of ordinary zinc. If the wire is drawn more quickly, at a slightly increased temperature, a brittle wire is produced. Experiments are being made with wires drawn from many other metals, including aluminum, tin, lead, bismuth, and others.

## HIGHWAY-MAINTENANCE TRUCK HAS COMPLETE EQUIPMENT

A highway-maintenance truck has been put into operation in California which would seem to be the last word in complete equipment. It carries a concrete mixer and combination material bin for cement, sand, and gravel. Also an air compressor and air tank which can be used for driving a rock drill for road work, or can be used in connection with a water-supply tank as a spraying outfit or fire extinguisher. There is also a centrifugal pump which can be used for filling the water tank or for pumping out cisterns or caissons. The truck engine furnishes all necessary power for driving the auxiliary equipment at various speeds through a special transmission. Flanged wheels may be substituted if so desired.



**For Highway-Maintenance Work, This Truck Carries Equipment for Almost Any Job That may be Encountered. All Auxiliary Equipment, Including Concrete Mixer, Air Compressor, and Centrifugal Pump, is Driven by the Truck Motor through a Special Transmission**



Machine for Babbitting Connecting-Rod Bearings. Left: With Connecting Rod Standing Upward, Babbitt is Poured through the Oil Hole. Center: With Connecting Rod Held Horizontally, Babbitt is Poured through the Shims. Right: With Connecting Rod Hanging Downward, Babbitt is Poured through the Oil Dip Hole

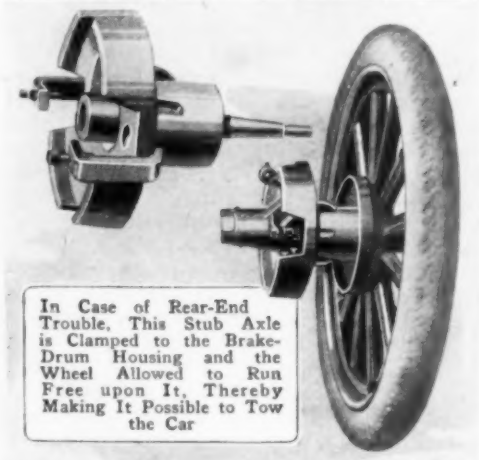
## MACHINE BABBITTS BEARINGS IN CONNECTING RODS

As equipment for shops where babbitting is done, a newly developed connecting-rod babbitting machine should be a time and labor saver. Although other kinds of babbitting work can be done with it, the machine is constructed specially to handle connecting rods from 6 to 24 in. long. On a stand, at a convenient height for the operator, is a faceplate with an arbor for the crankpin end of the connecting rod, and an adjustable carrier for the wristpin end, beneath which is a pointer that indicates on a measuring bar the correct length for centering the two bearings. When set up correctly, the connecting rod and its fixtures can be swung as a unit on a swivel, so that the babbitt can be poured with the connecting rod standing upward, hanging downward, or placed horizontally from the front or the side. Thus the bearing can be poured either through the oil hole in the top, the oil dip hole in the bottom, through the shims on either side, or through either side elsewhere, according to what best suits the construction of the connecting rod. The machine is also fitted with an alining device, and six arbors of different sizes are furnished with it, but special arbors can be made to fit any connecting rod.

¶Buds from an apple tree which produced seedless apples will be used by the Department of Agriculture in an attempt to propagate a new variety.

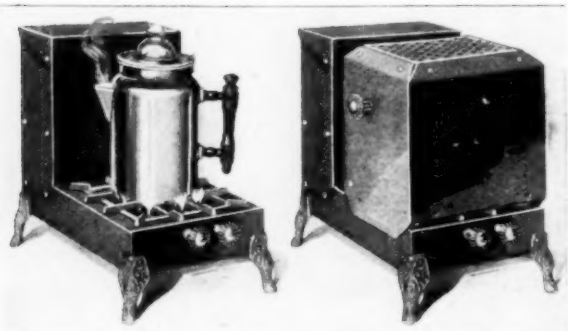
## DESIGN SEPARATE STUB AXLE FOR EMERGENCY TOWING

To meet the demand for a device that makes it possible to tow an automobile that has a broken rear axle or differential, a separate stub shaft has been designed. In order to move the disabled car, one rear wheel is removed and the emergency stub axle is clamped to the brake-drum housing. This furnishes an axle upon which the wheel can revolve freely and, because of the construction of the driving mechanism, releasing one wheel allows the other to turn, and the car can then be towed to the repair shop without the use of a dolly.



In Case of Rear-End Trouble, This Stub Axle is Clamped to the Brake-Drum Housing and the Wheel Allowed to Run Free upon It, Thereby Making It Possible to Tow the Car

## NEW FUEL USED IN STOVE OF PORTABLE DESIGN



Left: Portable Stove Which Burns New Kind of Fuel, Shown Accommodating a Coffee Percolator. Right: The Stove Fitted with Oven Attachment

Portable cookstoves and heaters are now available that burn a new kind of fuel derived from a process of expanding denatured alcohol. This fuel is manufactured under government supervision and requires a special burner, or converter, which is made of copper and brass and is claimed to last several years. An oven attachment is provided for the stoves, which are produced in numerous sizes, the smallest of which can easily be carried in a bag when traveling. Thus tourists can make use of the convenient little article.

## REBUILDING WRECKED ELEVATOR IS BIG TASK

The task of rebuilding and fireproofing the giant elevator of the Chicago and Northwestern Railway, at South Chicago, Ill., wrecked on March 19, last year, as recorded at the time in this magazine, was found to be such a big problem that it took experienced engineers some time to determine the proper methods of procedure. The elevator, with a capacity of 10,000,000 bu., was constructed of reinforced concrete. So vast were the piles of débris, so numerous the engineering difficulties to be surmounted, so elaborate the plans for rendering the new structure explosion-proof, that even with the employment of specially devised methods and a large force of workmen, the task of restoration seems slow and laborious.

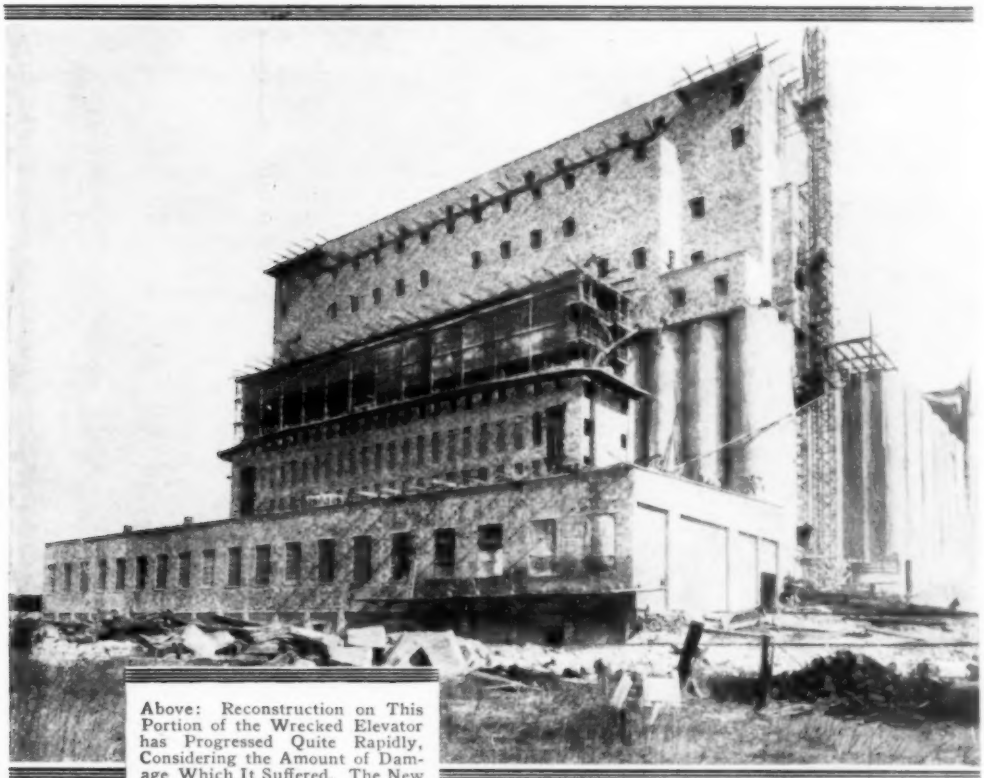
In cases where the surfaces had to resist a terrific stress, it has been found necessary to provide an overlapping of the new steel reinforcement upon that remaining in the parts left standing. It was thought better to obtain this overlap by cutting away enough of the concrete to expose the old reinforcement than by drilling holes into the standing concrete so that the ends of the new reinforcing bars could be inserted. The original plan was followed in laying the new steel reinforcement, forms were built up and the concrete poured. This plan was also followed in making great gaps in the bin walls grain-tight. In going over small cracks in outside walls, a thin cement mixture known as "eyewash" was used.

In small cracks, where reinforcing had been snapped off, it was necessary, in order to reach the steel, to enlarge the cracks to a width of 6 to 8 in., and then fill in with concrete. By having the filling opening at a higher level, the upper part of the aperture was compactly filled and no tamping was needed.

Greater precautions have been taken in this rebuilt terminal to fight the dust menace than in any other large elevator. Two separate dust-collecting systems are to be installed. The units of each system can be operated independently. All the dust will be piped directly to 15 collecting bins on the roof of the track shed, and then carried to collectors over dust houses outside of the elevator.

There will also be a special equipment for removing dust from floors, walls, and ceilings. At every 45 ft. about the large plant an inlet valve will be provided. Here can be attached metallic hose that will enable the operator to pick up grain and dust from the floors, ceilings, and walls at any point within 50 feet.

The new drier house will be separate from the working house. All drier fans are to be chain-driven, and dust-proof housings will inclose all these chains. The fans of the dust-collecting system are to be installed in a separate fireproof building. Compressed air will also be used for blowing dust out of motors and motor bearings of electrical appliances. All electrical panel boards will be erected in separate dust-tight rooms. To protect the electric lights, double vapor globes and heavy wire guards will be provided. It is hoped and expected that these precautions will prevent a repetition of the explosion that was powerful enough to lift from the supporting pillars the storage bins containing 6,000,000 bu. of grain.



Above: Reconstruction on This Portion of the Wrecked Elevator has Progressed Quite Rapidly, Considering the Amount of Damage Which It Suffered. The New Construction Is of Six-Inch Hollow Tile Instead of Cement Concrete. Below: A Portion of the Wrecked Elevator as It Appeared after the Débris had been Cleared Away. All Portions of the Standing Structure are Carefully Examined for Evidence of Weakness or Injury, and will be Repaired and Strengthened before the Destroyed Parts are Replaced

## HANDY BAG FOR CARRYING AUTOMOBILE-TIRE CHAINS

When tire chains are removed and thrown loose into the tool box of an automobile, they cover everything they touch with mud, and the next time they are wanted they are found tangled with wrenches, screwdrivers, and spare parts. The use of a new chain bag avoids all this. A long narrow bag is fitted with a top ring and, just below it, a collar ring. When the top ring is twisted down over the collar ring, the bag is closed. A single twist will open it when the chains are wanted.

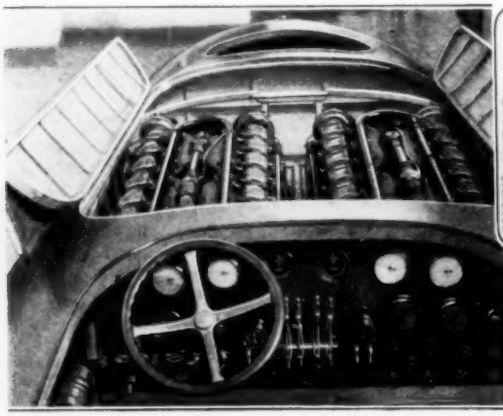
## SPECIAL COMPARTMENTS MAKE MOTORBOAT NONSINKABLE

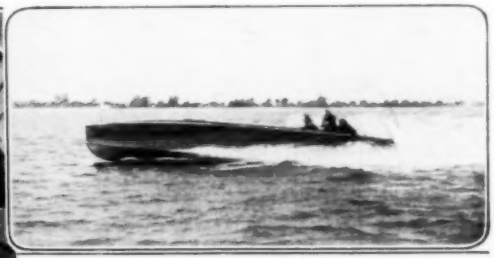
Anyone who has watched speedy motorboats racing knows how prone they are to suddenly take a nose dive and sink, particularly if the water is at all rough. This tendency to go under the water instead of over it, has been one of the hazards of motorboat racing, but now seems to have been overcome by a Los Angeles enthusiast. He has constructed a boat with four water-tight bulkheads made of $\frac{3}{8}$-in. plywood which divide the boat into five compartments. The two Liberty motors of 450 hp. each are in one compartment and are completely inclosed when the deck is folded over. All compartments except the operator's are water-tight and afford buoyancy in case the boat sinks. Besides these compartments, there are 100 air-tight bags made of balloon cloth, which are shaped to fit the available waste spaces in the boat and designed to add buoyancy in case of accident. In a recent trial this boat struck a wave and dived beneath the water, but the air-tight compartments brought it back to the surface as soon as the engines stopped.

## TRIPLICATE SCISSOR BLADES HAVE BUTTONHOLE SHEARS

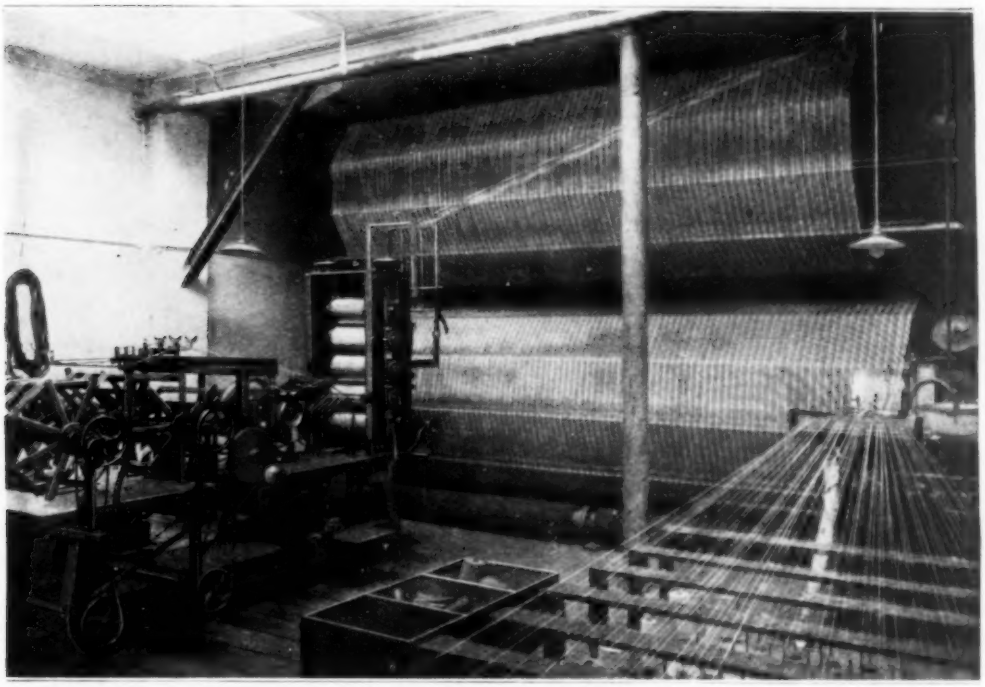
Triplicate scissor blades which include buttonhole shears, are incorporated in the recent invention of an eastern man. The third and smaller member is so arranged that it may be operated with either of the larger blades, and the user is thus provided with two kinds of scissors which are incorporated in but one instrument.

¶When you want anything and do not know where to get it, write Bureau of Information, Popular Mechanics, Chicago.





**Left: When the Deck is Folded Over, the Two Liberty Motors of 450 Horsepower Each are Entirely Inclosed. Above: The Nonsinkable Motorboat on a Trial Run. During One Trial the Boat Sank, but as Soon as the Momentum had been Overcome the Water-Tight Compartments Exerted Their Buoyancy and Brought the Boat to the Surface**



On These Large Reels for Drying Colored Ribbons or Tapes after They have been Dyed, the Strips are Carried on Metal Bands Passing between Metal Disks Supported at the Ends of the Reels

## MACHINE FOR DRYING STRIPS OF COLORED RIBBON

A machine for drying strips of colored tape or ribbon after it has been dyed, was patented recently by a Swiss inventor. It consists of a set of four large reels, each having disks at the ends mounted on a central shaft. Attached to these disks at right angles are other smaller disks over which extend metal bands running the length of the reel. The outer edges of these metal bands provide the supporting means over which the colored ribbons or tapes are wound in spiral fashion. After the strip of tape or ribbon has been wound on one reel, it is wound onto the next, and successively over the remaining two reels. As the reels are made very large, a great quantity of strips can be dried on the machine in a relatively short time, the capacity being about double that of former machines of equal size.

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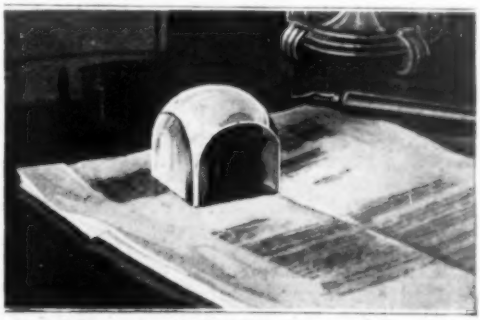
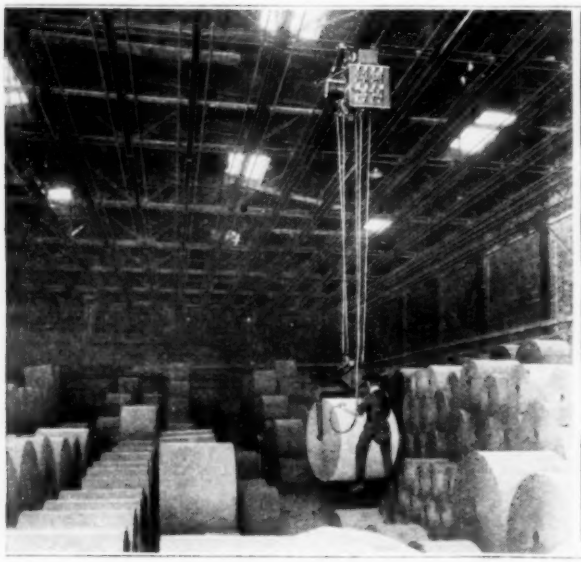
¶Wireless payments may now be made at any time on board the Cunard liners "Mauretania," "Aquitania," and "Berengaria," according to recent announcements of New York and London banking interests. Also, through branch banks on these ships, passengers can order payments made to persons in this country.

## NEAT PAPER WEIGHT IS ALSO A MAGNIFYING GLASS

For the examination of small-scale drawings, currency, or illegible print, it will not be necessary to go searching for a magnifying glass if one's office is supplied with a new magnifying paper weight which has just been placed on the market. It consists of a cube of optical glass, the upper surface of which is ground and polished in the form of a convex lens. It is not necessary to focus this lens, as it is in proper position for magnification when the paper weight is placed on the object to be enlarged.



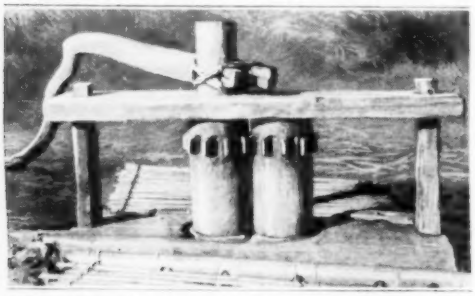
The Upper Surface of This Paper Weight Is a Convex Lens for Magnifying Drawings, Printing, or Currency Placed under the Weight



Left: One-Man Electric Crane Handling a Large Roll of Paper in the Warehouse. Overhead can be Seen the I-Beam Tracks and the Electric Panel Which is Controlled by the Push-Button Switch in the Hand of the Operator. Right: Close-Up of the Crane, Showing the Saddlelike Seat

## PRIMITIVE CANE MILL MADE ENTIRELY OF WOOD

Even today, in the Philippine Islands there are found primitive mills made entirely of wood, for squeezing the juice



This Old-Fashioned Mill is Constructed Entirely of Wood and is Used in the Philippines for Squeezing the Juice from Sugar Cane

from sugar cane. The rollers are cut from hardwood logs and are driven by wooden cog teeth set in the rollers. A carabao, or water buffalo, hitched to a crooked wooden sweep, furnishes the motive power to turn the rollers. The capacity of the mill is small.

## ONE-MAN ELECTRIC CRANE FOR HANDLING PAPER

Handling large rolls of paper and felt with a one-man electric crane, is the method employed by a western company in their storage warehouse. The crane is provided with a pair of jaws, or tongs, which fit into the core of the roll and which are manipulated by a lever attachment. A saddlelike seat is furnished for the operator, who has a push-button switch that controls the raising, lowering, advancing, and reversing of the overhead mechanism. An elaborate system of I-beam tracks is installed for the outfit to travel on, as well as numerous safety appliances for the prevention of accidents.

## NEW CONTAINER FOR SHIPPING RIPE FIGS WITHOUT INJURY

Few people, except those living in the states where they are grown, have ever enjoyed eating ripe figs, as it has been impossible to ship them in quantities with any assurance of their arrival in good condition. This difficulty seems to have been overcome now by the development of a container in which the figs are held apart by perforated cardboard strips. This method of packing prevents injury by abrasion and yet insures sufficient ventilation to keep the delicate fruit from heating and spoiling, as often happens when the figs are wrapped individually.

## INDUSTRIAL FILMS WILL BE CENSORED BY EXPERTS

With the great increase in the number of subjects being shown on the screen, that are prepared and taken in a wide range of industries, there comes the need of making certain that all scenes are technically correct in every detail. Especially is this true of the more scientific subjects, where the moving-picture camera is to record processes of manufacture or scenes taken in conjunction with research problems, the results of which are to be shown before a great many critical observers. A board of censorship has been set up by the Bureau of Mines, in conjunction with the Department of Commerce. It consists of three members, one representing the Bureau of Mines, and one from the Department of Commerce, while the third member is a representative of the industrial activity with which the picture deals. This board will do much to eliminate errors and correct technical details often overlooked.

## FIRST COMMERCIAL VEHICLES USING RADIO EQUIPMENT

Equipping its delivery trucks with wireless outfits, so as to keep constantly in touch with the drivers, is the original method employed by a Philadelphia company. Since the installation of the apparatus, the travel of the machines over the routes has been greatly facilitated.

Delivery Truck Showing the Aerial for the Wireless Messages Which Enable the Manager of the Company to Keep in Constant Touch with the Drivers: Note the Receivers on the Man's Ears

### WHERE ANCIENT AND MODERN CIVILIZATIONS MEET

IN the oil fields west of Tampico, Mexico, is an ancient Aztec burying mound, on the top of which the natives have erected a shrine. At the base of the mound, on either side, there are oil-rig towers, standing where wells have been drilled, appearing as fitting symbols of the modern civilization, while between them lies a village cemetery.

# CIVIC FEATURES THAT PROMOTE THE COMFORT

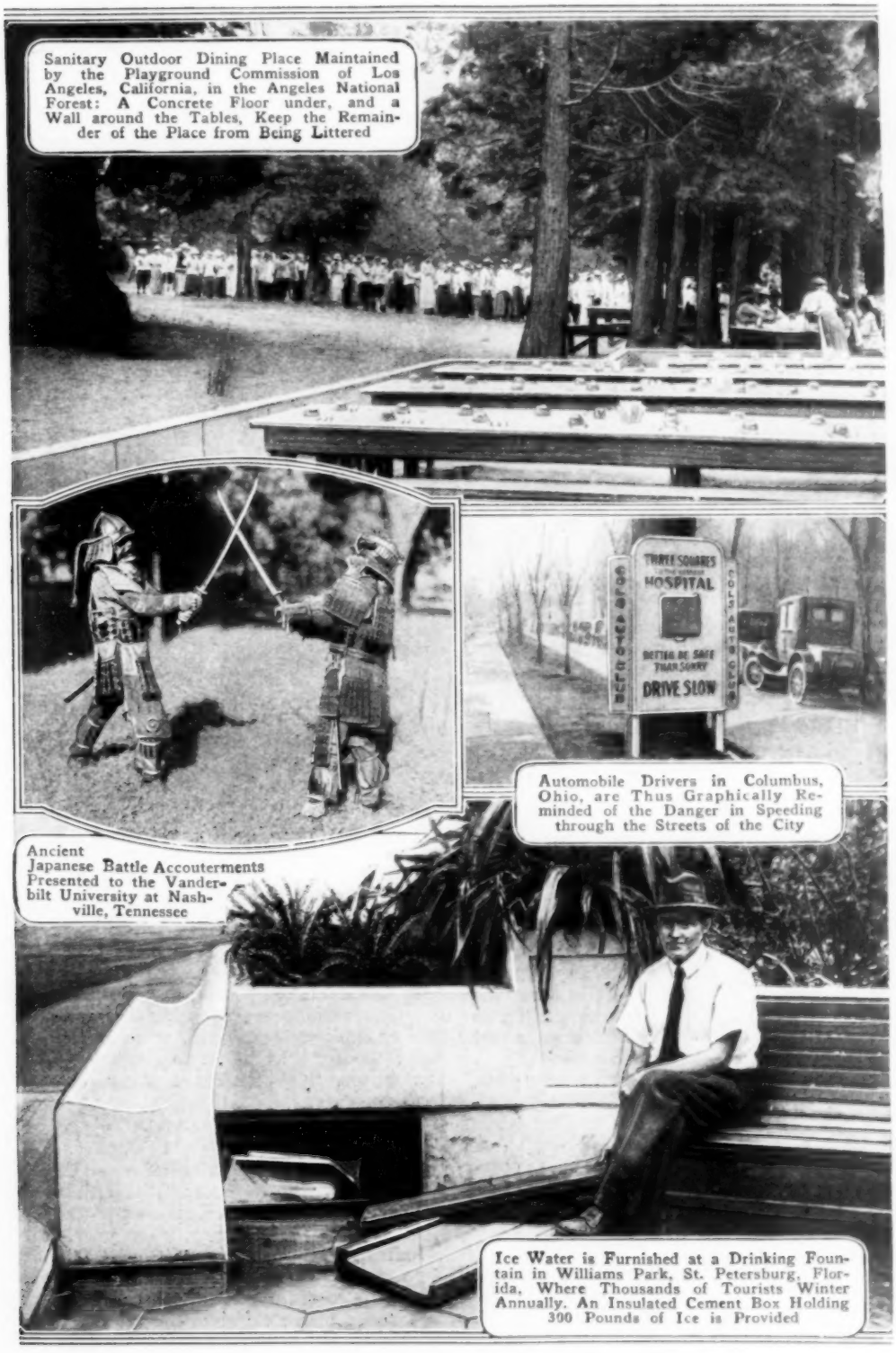
Above: Recreation Spot at the Rear of a Bookstore in Pasadena, California, Which was Designed after the Type of Spanish Courtyards of the 17th Century. Right: Another View of Courtyard, Showing the Ornamental Fountain

Overcrowding of a School in Ottawa, Illinois, Caused This Tiny One-Room House to be Erected for the Teaching of the Kindergarten Pupils

Signs of This Description are Employed by a Hospital in Alexandria, Louisiana, to Notify Motorists and Truck Drivers of the Patients' Rest Period

Over the Waimea River in Waimea, Kaual, Hawaiian Islands, is Hung This Strange-Appearing Bridge Which Serves Pedestrians in Crossing the Stream. Note the Unusual Approaches to the Structure

# AND ENJOYMENT OF VISITORS AND RESIDENTS




Sanitary Outdoor Dining Place Maintained by the Playground Commission of Los Angeles, California, in the Angeles National Forest: A Concrete Floor under, and a Wall around the Tables, Keep the Remainder of the Place from Being Littered

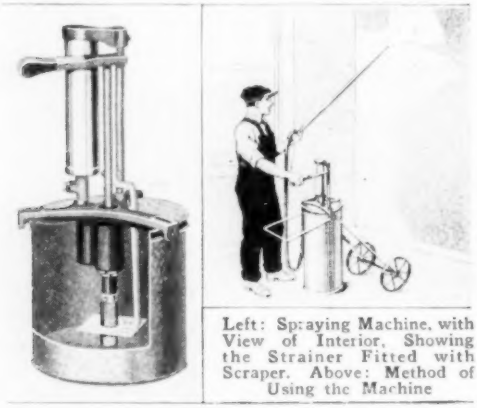
Automobile Drivers in Columbus, Ohio, are Thus Graphically Reminded of the Danger in Speeding through the Streets of the City

Ancient Japanese Battle Accouterments Presented to the Vanderbilt University at Nashville, Tennessee

Ice Water is Furnished at a Drinking Fountain in Williams Park, St. Petersburg, Florida, Where Thousands of Tourists Winter Annually. An Insulated Cement Box Holding 300 Pounds of Ice is Provided

## SPRAYING-MACHINE STRAINER PREVENTS CLOGGING

Spraying solutions for whitewashing, tree spraying, water-color painting, etc., invariably contain certain gritty ingredients which tend to clog the nozzle of the apparatus used. To alleviate this nuisance, a nonclogging machine has been perfected which has a self-cleaning strainer, fitted snugly over the end of the suction pipe. On the outside of the strainer is an agitator, or scraper, that moves up and down with the action of the pump handle, thoroughly cleaning the strainer with every stroke. Since there are smaller perforations in the strainer than are found in the nozzle, it is apparent that any particles passing through the former will be ejected from the latter.



Left: Spraying Machine, with View of Interior, Showing the Strainer Fitted with Scraper. Above: Method of Using the Machine

## CRYSTAL-GLASS REFLECTORS FOR USE IN SPOTLIGHTS

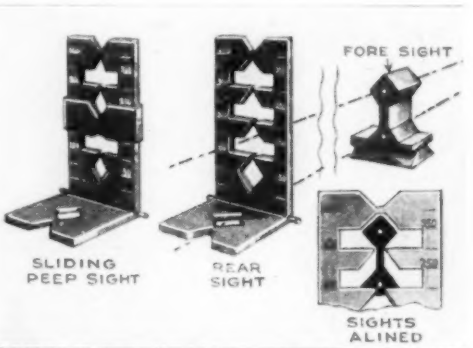
For all kinds of spotlights, reflectors are now being made from crystal glass in molds which are under water, the red-hot glass being blown into them and turned continuously. When taken from the molds the glass is annealed, chemically cleaned, treated to a hot process of silvering, and finished with a gutta-percha paint that is absolutely impervious to dust and moisture. The result is a reflector with the lasting qualities and brilliancy of a silvered plate-glass mirror. These reflectors are being made in sizes from 3-in. diameter for flashlights to 18 in. for locomotive headlights.

## DREDGE BASIN AND CHANNEL IN BAHAMA ISLANDS

The removal of more than a million cubic yards of rock and sand in the dredging of a mooring basin and channel, is the announced intention of the government of the Bahama Islands. The basin will be 600 ft. square and 25 ft. below the depth of low-water level, while the channel will be approximately 5,600 ft. in length, at a depth of 25 to 27 ft., and will range from 250 to 400 ft. in width.

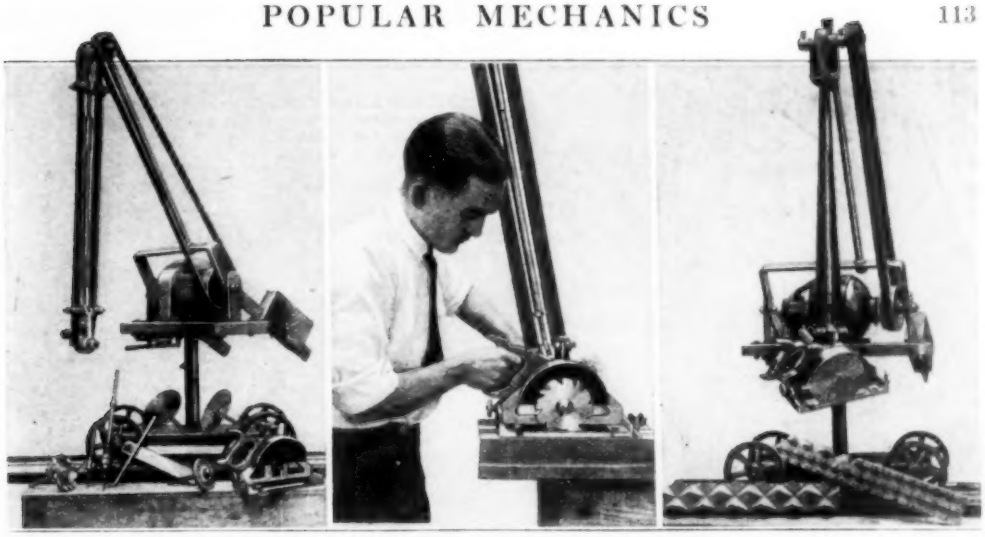
## GUN SIGHT OF NEW DESIGN EASY TO MANIPULATE

Gun sights for long-range shooting are usually rather complicated, but a set of these, lately invented by a western man, are very simple and efficient. The front sight is diamond-shaped, and that in the rear has openings of the same pattern in it. Graduations representing 25 yd. each, and extending to 450 yd., are marked on the rear sight, and due to the design of the whole, the slightest canting, elevating, or lowering of the gun, is at once perceptible to the marksman.




Gun Sights Which Enable the Hunter to Secure the Proper Range without Adjusting Complicated Apparatus

¶Apart from the plans of the U. S. Government, in connection with the Brazilian Centennial Exposition, to be held in Rio de Janeiro, this year, for which an appropriation of $1,000,000 has been made by Congress, an "unofficial" American building will be erected there. The contract for this building has already been awarded to a New York concern.



Electrically Operated Woodworking Machine That is Mounted on Four Wheels That Run on the Bench Track Seen at Left, Where Various Tools Used with the Machine are Shown: At Center, the Machine is Shown Dadoing, and at Right Making Angular Saw Cuts

## NEW VARIETY OF BARLEY HAS STRIKING QUALITIES

Growing in a field of wheat mixed with much barley, what is evidently a new variety of barley has been discovered which is possessed of many unusual qualities. Instead of the usual three to seven nodes, the new barley has from 10 to 30 nodes, with the striking capacity to produce roots at any of these nodes. It also has the property of being able to branch at any node, with the further capacity for secondary and later branching. This new variety is not of practical agricultural interest as yet, but is being studied because of its scientific interest.

## NEW WOODWORKING MACHINE OF MULTIFARIOUS USES

An electrically operated machine that will do almost anything done in woodworking, is the recent development of a Cincinnati manufacturer. The machine is mounted on four wheels, adapted to run on a track on the back of a carpenter's bench. Mounted above the wheel frame is a 1½-hp. motor, and adjustably connected to its support is an arm, at the end of which are belt pulleys and a suspended rod. At the lower end of this rod is another belt pulley, which drives a hollow spindle, into which can be inserted mandrels for operating various tools. This operating point of the machine hangs over the front of the bench, and can be moved into any position most suitable for the work in hand. Supplied with the machine is a cutter head that will do any simple molding, beading, tonguing, grooving, and splining, and there is also a boring mandrel that does the work of a brace and bit.

## HAIR DRIER OF SIMPLE MAKE PROVES VERY EFFECTIVE

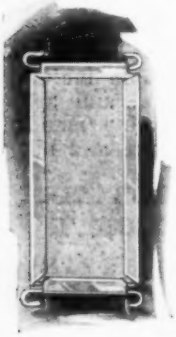
Drying hair in a simple and effective manner is possible with the use of a lately introduced and long needed domestic appliance, which operates safely and at small cost. The drier consists of a funnel-shaped piece of galvanized-tin, having a long narrow neck, which terminates in a bell-shaped end. Placed over any common alcohol, kerosene, or gas burner, the funnel throws a hot blast of air for a distance of three feet. The outfit weighs only 1½ lb., is claimed to be absolutely smokeless or odorless in operation, and requires but 15 minutes to dry the heaviest head of hair thoroughly.

# SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

This Electric Boudoir Lamp Has Six Different Intensities of Light

Electric Alarm Clock Which Automatically Switches On a Light in the Room When the Alarm Goes Off

Sanitary Milk Box That is Placed on the Wall of the Porch as a Protection against Thieves, Animals, and Insects

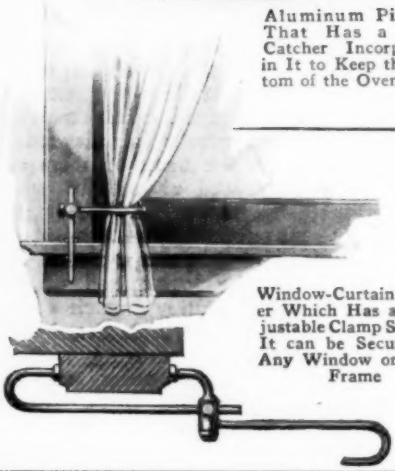


Match Scratcher Which is Designed to be Attached to the Inside of a Coat by Means of Safety Pins

This Serviceable Bathroom Stool is Combined with a Shoe-Shining Convenience. The Front Side Drops Down So That the Person can be Seated While Polishing the Shoes, and the Footrest Is Adjustable as to Height and Position

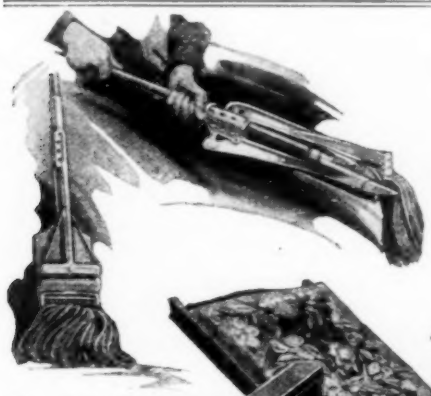
Aluminum Pie Pan That Has a Juice Catcher Incorporated in It to Keep the Bottom of the Oven Clean

Portable Refrigerator, Specially Adapted for Small Families, Nurseries, and Hospitals, Which Contains Unusual Insulation against Heat

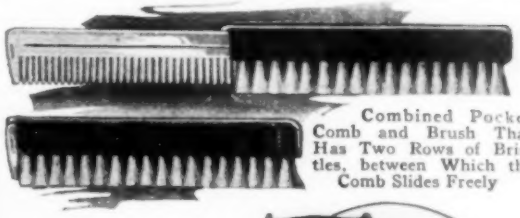


Window-Curtain Holder Which Has an Adjustable Clamp So That It can be Secured to Any Window or Door Frame

*Anyone wishing further information on devices described in the editorial pages can*

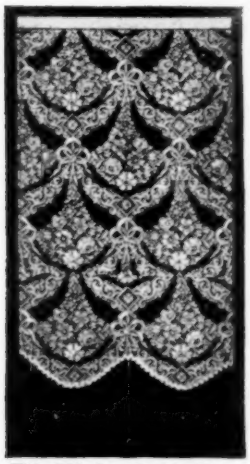


This Self-Wringing Mop Eliminates the Placing of the Hands in Dirty Water. The Mop is Wrung by Pulling the Wringer Handle Back and Forth



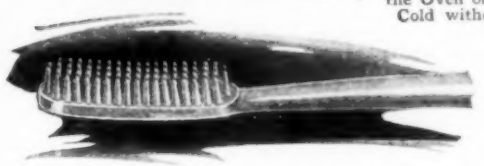
Combined Pocket Comb and Brush That Has Two Rows of Bristles, between Which the Comb Slides Freely

Combination Chair, Bed, and Writing Desk Which Has Waterproof Cushions That Are Reversible. One Arm Swings Back, Permitting an Invalid to be Lifted Easily into the Chair



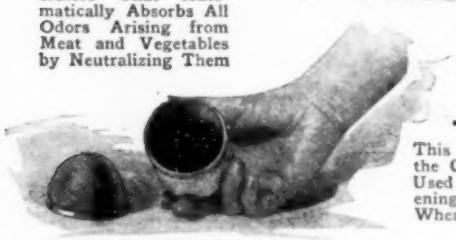
This Window Shade Has a Patented Covering That Gives It the Appearance of a Lace Curtain from the Inside, and That of an Ordinary Shade from the Outside

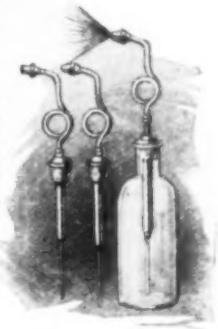
Tea Set of Heat-Resisting Iridescent Glassware Which can be Placed in the Oven or Exposed to the Extreme Cold without Danger of Breakage



Toothbrush Which is Made Entirely of Rubber Instead of Having the Usual Bristles, and Which can be Sterilized in Boiling Water without Injuring the Composition

Deodorizer for Refrigerators That Automatically Absorbs All Odors Arising from Meat and Vegetables by Neutralizing Them



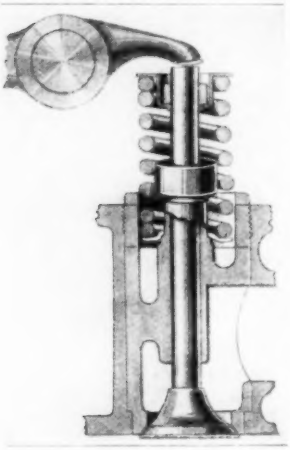


This Handy Sprayer Fits into the Cork of a Bottle and can be Used for Spraying Plants, Dampening Laundry, Settling Dust When Sweeping, and Other Household Purposes

*obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago.*

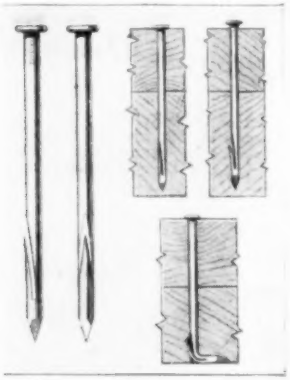
## TINY OIL CUP INSIDE SPRING LUBRICATES VALVE STEM

Any motorist who has been annoyed by sticking valves will welcome a little device for which patent application has recently been made. It is only necessary to cut off a small amount of metal from the upper end of the valve-stem guide and place a small oil cup at this point, inside the valve spring. When the upper cup washer is filled with oil, it will seep down the valve stem and deposit itself in the lower cup, from which it is automatically forced down through the valve-stem guide, lubricating that part of the mechanism.



## DRIVING END OF ANY NAIL MADE SELF-CLINCHING

A self-clinching nail, recently patented, has a slot cut near the driving end of the nail in such a manner that it leaves a sharp arrowlike point on the shank of the nail. When driven into wood any withdrawal of the nail causes this sharp point to stick into the wood, and thus resist such withdrawal. Should the point of the nail strike anything hard it will bend easily, and the sharp point will act in the same way as when not bent to resist withdrawal.



¶Our Bureau of Information will answer all questions regarding articles appearing in this magazine.

## SUGGEST TERM TO DESIGNATE WEIGHT OF TON MEANT

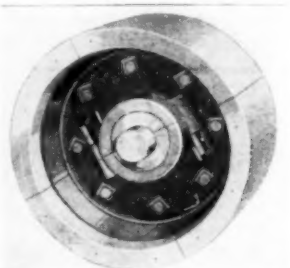
While references to the ton weight in America is accepted as meaning 2,000 lb., some countries still use the short ton of 2,000 lb. and the long ton of 2,240 lb., and as a means of preventing misunderstanding, it has been suggested that identifying terms be adopted by manufacturers. Unless circumstances demand it, the term "ton" shall mean 2,000 lb. In special cases "S-ton" shall be used. The weight of 2,240 lb. shall be designated as "L-ton" as a positive means of identification.

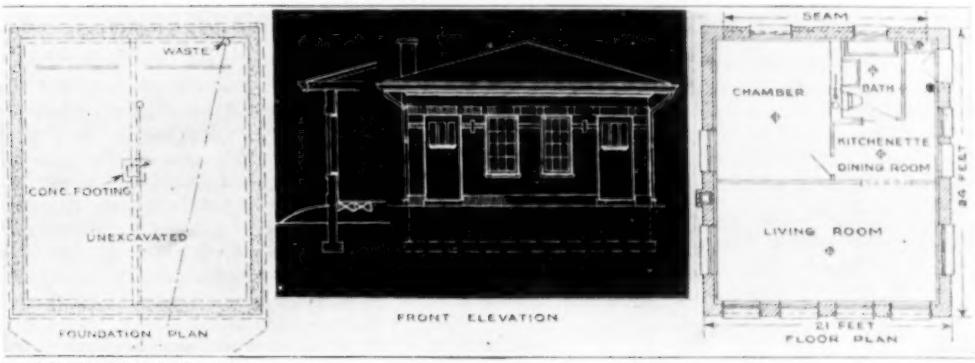
## HANDY TOOL FOR PLUMBERS HAS AUTOMATIC JAWS

Another tool for the plumber has been introduced as a means of facilitating the removal of basin nuts, ball cocks, valve tubes, or for working on small pipes. This appliance, which has automatic jaws that need no adjustment to make them grip, is 8 in. in length and weighs about one pound.

## SIMPLIFIED SPLIT PULLEY HAS NO BOLTS OR NUTS

A split pulley that can be put in place on a shaft by simply driving in two steel wedges, supplied with the pulley, with an ordinary hammer, is now on the market. The rim of the pulley is of hardwood, and the central part is cast iron. A keyseat is not needed in the shaft. This simplicity makes it possible to put the pulley in place very rapidly and easily.






EDWARD GEORGE MC CLELLAN, ARCHITECT

**Plans for Combined Bungalow and Garage, Called a "Garlow": The Foundation Is All Concrete, and the Outside Walls Are Pressed Brick, with Stone Door and Window Sills. The Partitions Shown in Floor Plan, as Well as the Rear Wall between the Two Seams, Are Easily Removable for Conversion of the Bungalow into a Garage**

## EITHER BUNGALOW OR GARAGE AT THE OWNER'S OPTION

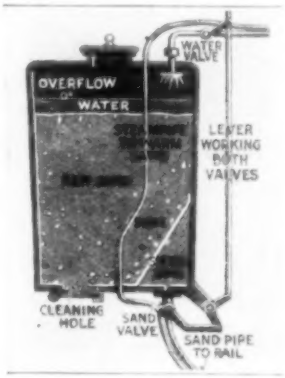
A novel form of residential structure, called a "garlow," as its name implies, is a combined bungalow and garage; that is to say, it starts out by being the former and ends up by being the latter. It is very useful to the purchaser of a city or suburban lot, who is going to build a good home, but for lack of either time or money must begin on a small scale. First then is built this garlow in the form of a modest bungalow, with partitions that can easily be taken away, and part of the rear wall removable, to be replaced later by a large garage door. It is on a concrete foundation, with outside brick walls, and doors as well as windows which are permanent in all walls except the rear one. It is built on the rear of the lot where the garage would naturally be, and is drained to a catch basin in the yard, which will also be used later for drainage of the permanent residence. This, of course, will be built on the front of the lot, and when it is finished the garlow will become a garage.

## RAWHIDE USED IN FAN BELTS AND BLOWOUT PATCHES

For blowout patches for tires, and for making fan belts, a new fabric is being made by subjecting rawhide to a process that makes it nonelastic, and then covering it with heavy rubber-frictioned cotton duck. The toughness of the rawhide makes the material very puncture-proof and durable when used on tires, and for this purpose it is made in the form of a patch with two strong flaps that tighten over the beads and hold the patch in place. When used for fan belts, its non-stretching property causes it to grip all the tighter when subjected to heat, instead of expanding and slipping, as with the common leather belt.

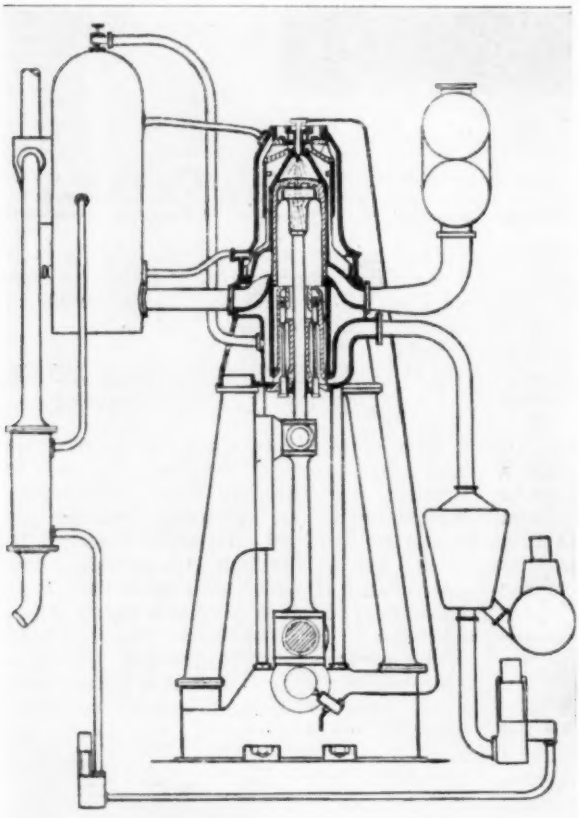
## IMPROVEMENT OF SAND BOXES USED ON LOCOMOTIVES

The simple box used on locomotives and elsewhere for sanding the rails to prevent slippage has been considerably elaborated in an invention recently patented in England. Inserted through the closed top of the box is a sprinkler rose on the end of a pipe that leads to a water container. In this pipe is a valve that is connected by a swiveled rod and bell-crank arrangement to another valve in a pipe below the sand box that conveys the sand to the rail. These two valves, in this manner, open or close simultaneously, so that whenever sand runs down the sand pipe, water is sprinkled on the sand in the box, in order to keep it moist. A pipe from the boiler runs in at the top of the sand box, out at the bottom, and then along the length of the sand pipe so that whenever necessary, steam can be turned on to keep the sand warm. A screen is also fitted in the sand box for preventing pebbles, or anything of that nature, from reaching the opening to the sand pipe.



## REMARKABLE DEVELOPMENT IN MARINE OIL ENGINES

There are now being installed in a new twin-screw liner, after several years of experimental work, two late types of the British heavy-oil engine that utilizes the heat of the exhaust gases, and the cylinder water jacket, invariably wasted in other types of internal-combustion engines. This engine was mentioned, when first invented, in the August, 1915, issue of this magazine. Its fundamental principle is the recovery of waste heat, and its conversion into power through the medium of steam. This type of engine is, in fact, a combination of the steam and the internal-combustion engines, for steam acts on one side of the piston, and oil combustion takes place on the other side in the same cylinder. A very small boiler—not much larger than the engine cylinder and its jacketing—is part of the installation. The combustion of the oil is by means of compression on the Diesel principle, and this boiler has a burner for generating steam for starting the engine, or for taking care of an overload when running. Normally the boiler acts as a receiver for the steam derived from the waste heat of the exhaust gases by water-jacketing the exhaust pipe, which connects the working cylinder with the boiler, and from a feed-water heater, to which the exhaust gases are also piped. By means of a pump the feed water is circulated through these heaters, and then passed to the cylinder jacket of the engine, where it gains more heat and is then returned to the boiler, where the heat is sufficient to generate steam for one end of the power cylinder. Thus, the waste heat is utilized for adding power, without consumption of extra fuel, and a further advantage is that, on account of the high temperature of the cylinder-cooling water, the compression pressure for combustion of the fuel can be considerably lower than in the ordinary Diesel engine. In connection with the steam end of the power cylinder is a condensing plant. It will be obvious that the engine operates, on its combustion side, upon the two-stroke port-scavenging principle, with no valve except that for the fuel injection. On the steam side are, of course, inlet and exhaust valves. The combustion and steam operate alternately, so that the engine is double-acting, though naturally the power developed on the steam side is considerably less than that developed on the combustion side. Although as yet this remarkable engine has been applied only for marine service, the possibilities for land work are considerable. Its high efficiency would make it specially suitable for use at central power stations.



Combined Steam and Internal-Combustion Engine with Cylinder in Section, Showing Combustion Chamber above Piston, and Steam Cylinder with Inlet and Exhaust Valves below It

## SEARCHLIGHTS USED TO ROUT SWARM OF BEES

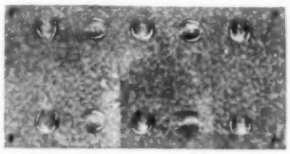
Bees are seldom respecters of human rights when they find a new queen and decide to swarm. Accordingly they are often a source of "stinging" embarrassment to persons who are compelled to work in the vicinity of a location chosen by the bees for swarming purposes. An

incident of this kind occurred at Universal City, Calif., recently when a swarm of bees chose an outdoor motion-picture "set," upon which several cameras and a corps of actors and actresses were working. In a few minutes the bees became so annoying that chaos reigned, and it seemed necessary to stop the production of the picture for the rest of the day—obviously at heavy loss to the producers.

Seeking some means of driving the bees away, the director of the picture bethought himself of the powerful electric searchlights. Half a dozen of these were hurried to the "set" from the "electric stage," and the battery of lights were turned upon the swarming bees. In less than a minute the bees began to scatter, and in five minutes more every bee had been driven away.

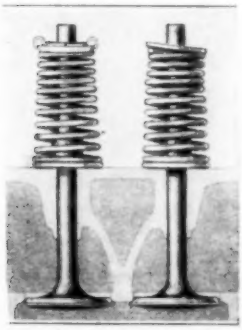
## ICE CARRIER FOR MOTORISTS SIMPLE AND CONVENIENT

Carrying a cake of ice on, or in, an automobile is a rather difficult and dirty task, and to simplify this, a Texas company has produced a neat carrier. This article, made of a 5 by 10-in. plate of galvanized iron, contains perforations having rough edges which prevent the ice from sliding, and is fastened by four screws to the running board of the car.



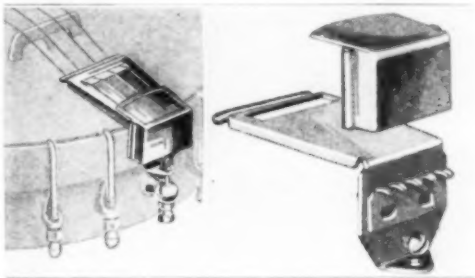
## ONE-PIECE SPRING RETAINER FOR POPPET-VALVE STEMS

For use on poppet-valve stems, there is now on the market a one-piece spring retainer that can be assembled with one hand, there being no pin to insert. Two small flexible arms on top of the spring retainer slide over the end of the valve stem, and when the retainer is pushed upward by the spring, these arms are automatically engaged in a groove in the stem, and hold the retainer in place.



## BANJO STRINGS MADE SNAPPY BY EXTENSION TAILPIECE

A new extension tailpiece for a banjo is so constructed that pressure is brought to bear on the strings just behind the bridge, and it is claimed that this results in a louder and snappier tone. In connection with the extension is an attaching device, from which the strings pass along the extension through a slot near its end, finally under a beveled bar and up over the bridge.



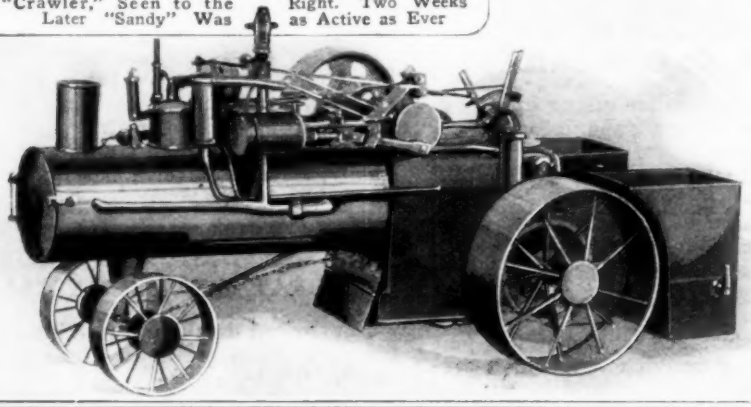
**Left: Extension Tailpiece on a Banjo, Showing How Pressure is Brought to Bear on the Strings Just behind the Bridge. Right: the Tailpiece Disassembled**

## POULTRY DRINKING FOUNTAIN OPERATES AUTOMATICALLY

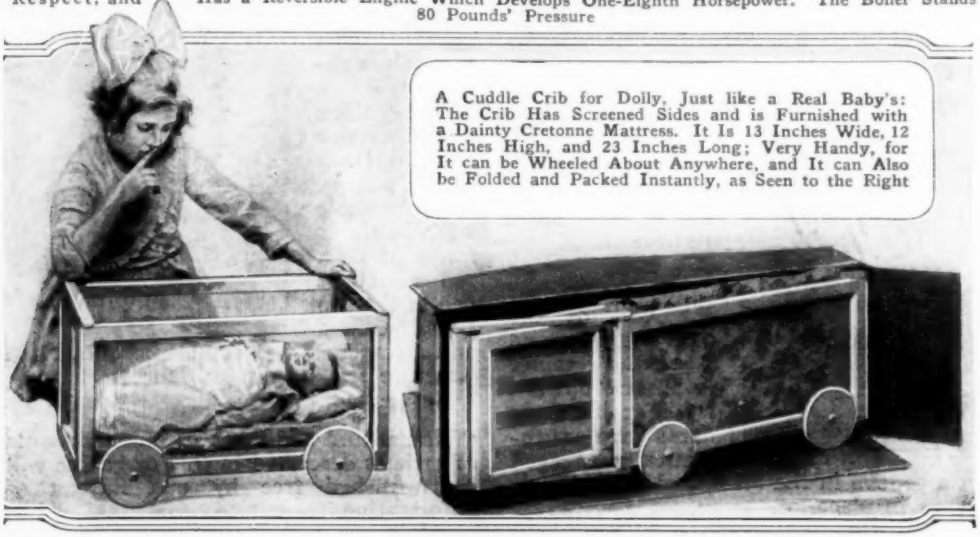
Improvised drinking fountains for poultry may be seen in any barnyard, and one of these, of unusual construction, has lately appeared on the English market. This fountain consists of a three-gallon container placed in a small pan or tray, the whole of which is made of zinc. An air-tight cap in the top permits filling, and a tiny hole in the bottom allows the water to trickle out into the tray.

¶Names and addresses of manufacturers of articles described in this magazine will be furnished free by our Bureau of Information.

This Airedale Pup, Called "Sandy," Is, as His Name Implies, Scotch, but Was Not "Canny" Enough to Avoid an Auto Which Broke His Back. A Veterinary Put Him in Splints, as Seen at the Left, and 17 Days Later "Sandy" was Going About with the Aid of the "Crawler," Seen to the Right. Two Weeks Later "Sandy" Was as Active as Ever



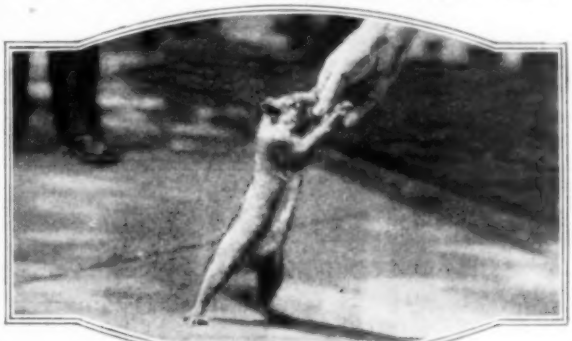
This Looks like a Regular Full-Sized Steam Tractor, but It Isn't. It Is Only a Little Model of One, 30 Inches Long, 14 Inches Wide, and 16 Inches High, Designed and Fabricated Single-Handed by an 18-Year-Old Boy, Alfred Getz, in His Father's Welding Shop at Kalispel, Montana. It is Completely Equipped in Every Respect, and Has a Reversible Engine Which Develops One-Eighth Horsepower. The Boiler Stands 80 Pounds' Pressure



A Cuddle Crib for Dolly, Just like a Real Baby's: The Crib Has Screened Sides and is Furnished with a Dainty Cretonne Mattress. It Is 13 Inches Wide, 12 Inches High, and 23 Inches Long; Very Handy, for It can be Wheeled About Anywhere, and It can Also be Folded and Packed Instantly, as Seen to the Right

On the Porch, between the Two Big Dogs, Each of Which Probably Weighs as Much as She Does, Is the Little Girl Who Was the Designer of This Playhouse, Probably the Youngest Architect in the Country. Her Name Is Helen, and She Is the Daughter of Harry Wardman of Washington, District of Columbia. The House Has Three Rooms, Electrically Heated and Lighted, and is Appropriately Furnished

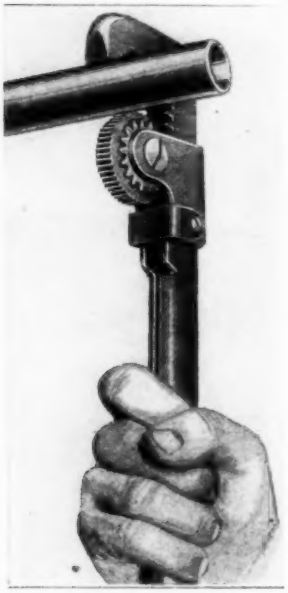
A Practical Auto Wagon for Boys, Easily Steered and Propelled, with a Seat in Front for a Passenger, and Lots of Room for Baggage — Very Handy for Delivering Newspapers



Left: The Youngest Boy Scout in Panama, but Not Too Young to Take a Solitary Hike Clear across the Isthmus from the Atlantic to the Pacific. He may Not Be a Man in Years, but He Is "Mann" by Name—Timothy Mann, Brother of Alma Mann, the Water Nymph, Who has Won Much Renown as a Swimmer. Right: This Gray Squirrel, Snapped on the Grounds of the Capitol at Harrisburg, Pennsylvania, is Evidently Not Afflicted with Any Excessive Timidity. He Stands Up like a Little Man, and Caresses the Big Hand with His Paws and Snout Eagerly. There Is a Reason—in the Hand Is a Tasty Nut

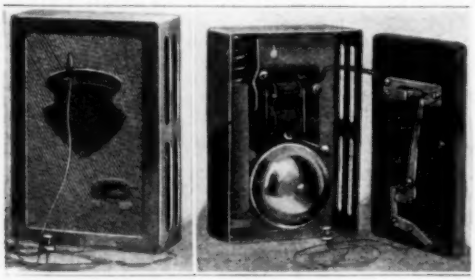
## NEW ONE-HAND PIPE WRENCH IS SIMPLE AND STRONG

A new make of pipe wrench that has an unusually tight grip on a pipe, and that is to some extent self-adjusting, is in the form of an all-steel one-hand wrench, with one fixed jaw, and the movable jaw pulled back by hand. A light spring in the handle slides this jaw forward. The two jaws make a three-point contact with the pipe, and the greater the pressure on the handle, the greater is the grip on the pipe. The movable jaw is in the form of a small serrated wheel, and the wrench is released from the pipe by simply pushing the handle forward instead of pulling it backward, as when turning the pipe.



## PORTABLE BURGLAR ALARM SIMPLE AND EFFECTIVE

Protection against burglars is provided by the use of a simple but effective alarm which consists of a bell and battery outfit placed inside a metal case with a hard-rubber cover. By means of specially arranged contacts, the alarm can be adjusted and held in tension by a thread, or string, the touching of which causes the bell to ring. Thus with the thread stretched across open windows, or attached to windows and doors that are closed, anyone attempting to enter will sound the alarm by disturbing the thread. The device is only 6 in. long, 4 in. wide, 1½ in. thick, and weighs about 2 lb., so that it can easily be carried for safety when traveling. Warning of fire is also given by the contrivance, as the burning of the thread would release the spring and accordingly set off the alarm.



Left: Exterior of Portable Burglar Alarm. Right: Interior, Showing Bell, Battery, and Alarm Contacts

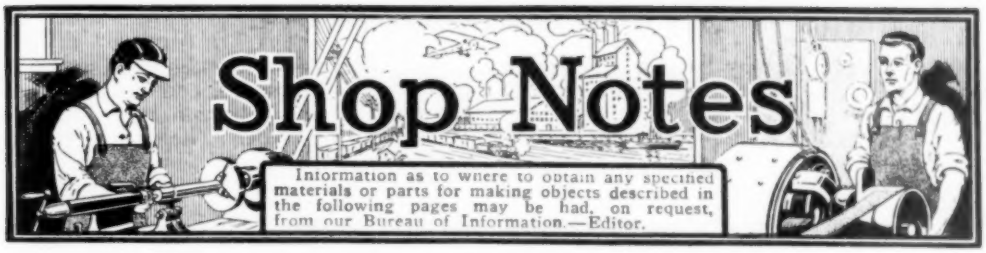
## SELF-SUPPORTING SAXOPHONE ADJUSTABLE HOLDER

To the tired musician a practical holder or supporter for the saxophone will be of great assistance, as these instruments, particularly the large, bulky ones, held by a small strap around the neck, become very burdensome when carried continuously for two or three hours. This new holder is strong and rigid, with a telescoping top that can be adjusted to fit any saxophone, and also to suit the height of any player. The whole weight of the saxophone is supported, and the musician's hands are entirely unencumbered, and have more freedom of action in operating the keys.

## GERMAN BAYONETS CONVERTED INTO CHOPPING MACHINES

For use in the provinces of Germany where wood is the principal fuel, wood-splitting machines, made from reclaimed war bayonets, have been introduced. The machines have become very popular and are quite simple, operating on the leverage principle. Their further importation, however, is forbidden, as the bayonets can easily be detached and could be used for war purposes.

¶ The farthest-north church in the world was recently completed, according to a wireless report from Advent Bay, Spitzbergen, close to 80° latitude.


Shop Notes
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

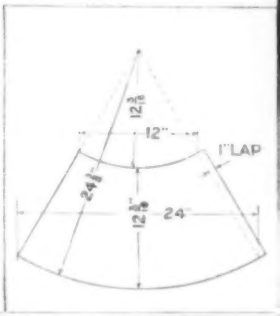
# Making Concrete of Maximum Strength

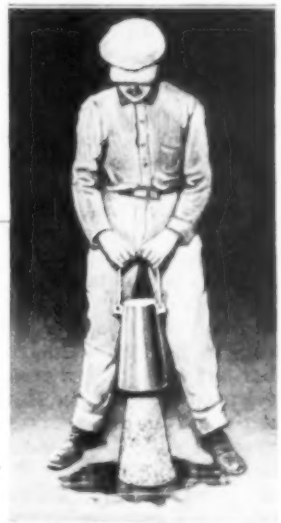
By A. J. R. CURTIS

ALTHOUGH concrete is already recognized as having more diversified structural uses than almost any other material, some of its important characteristics have still to be thoroughly investigated.

The principal ordinary ingredients of concrete are Portland cement, sand, pebbles (or stone), and water. Early in the history of concrete the conclusion was reached that the quality of the product could be controlled largely by constant tests, to insure the quality of the binding element—cement. Further study revealed the equal necessity of testing and rectifying the defects in the "aggregates," the latter term being used to designate the sand, pebbles, stone, or other nonmetallic minerals united by the cement. In good practice the aggregates usually compose from two-thirds to four-fifths of the concrete mass.

For many years these tests were supposed to provide about all the scientific data required with respect to the concrete mixture. The water present was considered merely a lubricant, to be used in the mixture in almost any quantity found convenient. It is only recently that the staff of the Structural Materials Research Laboratory, Lewis Institute, Chicago, of which Prof. Duff A. Abrams is chief, discovered that the plasticity of the concrete mixture and the relation of the amount of water to the amount of cement present are vital considerations so far as the strength of the resulting concrete is concerned. The curve shown in Fig. 2 illustrates diagrammatically the manner in which similar concrete mixtures develop greater strength with the use of more water up to a certain point, beyond which an addition of water causes the strength to diminish. This curve is a composite of many similar curves, plotted from results obtained by adding various amounts of water to mixtures of different proportions, using various typical concrete materials.



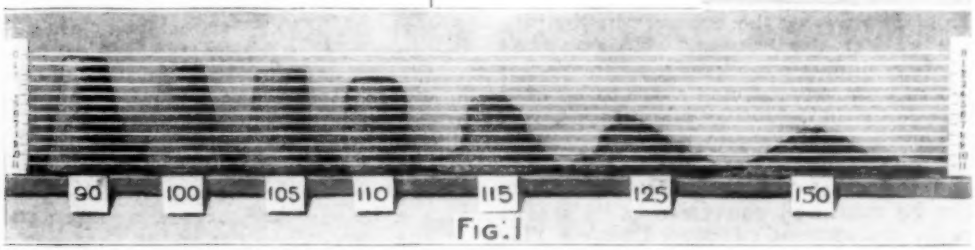



FIG. 1

Lower Illustration: "Slump"-Test Specimens Made with Varying Amounts of Water. Notice How the Piles on the Right have "Slumped" from Their Original Height. Upper Left: Plan for Galvanized-Iron Form for Making the Slump Test. Upper Right: Removal of the Slump-Test Mold by a Steady, Vertical Pull

The amount of water required to produce a concrete mixture of greatest strength is designated in this diagram as

100 per cent. It may be noted from the curve that a 10-per-cent reduction of water from the 100-per-cent point produces at least a 25-per-cent reduction in strength; an increase of 10 per cent in

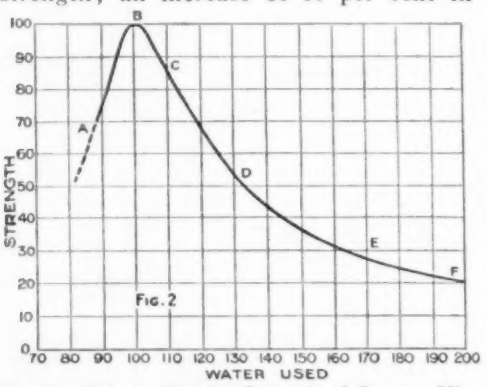



Diagram Showing Varying Strengths of Concrete Mixtures Due to Variation in the Amount of Water Used

water above the 100-per-cent point produces a 15-per-cent reduction in strength. These are, of course, average figures, but show clearly that there is one consistency for every mixture which produces greatest strength, and that deviations from it are accompanied by a sacrifice in strength.

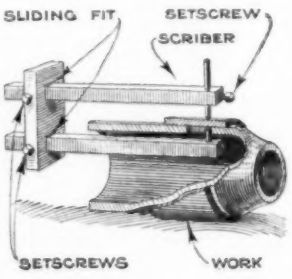
Compare this curve with the illustration in Fig. 1. The latter shows a number of piles of concrete made of identical materials, in identical proportions, but with various amounts of water. The pile marked 100 represents the consistency designated as 100 per cent in the diagram, and the other piles represent corresponding percentages from 90 to 150. The wetter the concrete in the pile, the greater the "slump." This method of determining consistency, although but recently introduced, has come to be used commonly in scientific laboratories, and is known as the "slump test."

Slump-test cones are made 12 in. high, and the extent of the slump in inches can be measured conveniently by means of an ordinary rule equipped with a sliding crossbar. Fig. 1 shows a plan for a galvanized-iron form for producing specimen batches for the test.

The form is placed on a smooth, level floor, or substantial table, and the concrete is deposited in it in four or five small batches, each batch being tamped briskly with a ¼-in. round rod before the next batch is deposited. When the mold is filled with the mixture, the top is struck off level. The mold is then withdrawn by a steady vertical pull without vibration. After a few minutes the amount of the slump is measured, and comparison is made with the illustration in Fig. 1 or a corresponding table. The result will reveal whether the mixture is too dry or too wet for maximum strength. In some cases the probable reduction in strength on account of too much or too little water can be judged approximately. Owing to the variation in methods of handling concrete for the many uses to which it is put, the employment of the consistency that will give maximum strength is frequently impracticable, it being more economical to use a little more material than to use the ideal consistency. In all cases it is desirable to use the proportion of water that gives the greatest strength within the practical limits of the handling methods employed. It is also desirable to know the probable approximate reduction in strength caused by limitations of handling methods, so that this may be taken into proper account in the design.

## Scriber for Marking Patches

For locating and scribing setscrew holes, oil holes, or slots at any point, on a patch or ring that has been shrunk over the hole or slot, the scriber shown will save considerable time. As an examination of the drawing will show, the device is extremely simple, consisting of only a square steel block and two movable arms, the latter sliding through holes in the block, and locked, when adjusted, by means of setscrews. The lower arm is fitted with a locating pin driven tightly into a hole drilled near the outer end of the arm, while the upper arm has a scribing point fitted near its end, a setscrew making the scriber adjustable for different thicknesses.

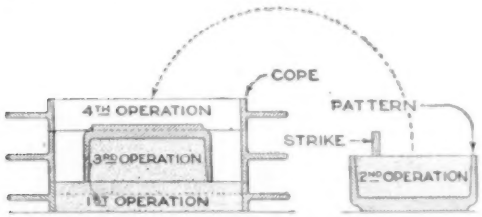



When a hole is to be located, it is only necessary to insert the arms into the work, until the locating point on the lower arm enters the opening; the scribing point is then adjusted and the device manipulated until the location of the hole has been scribed on the surface of the ring or patch.—Leon Yacobyan, New York City.

## Casting without Rolling the Flask

Ordinarily, in casting a steel annealing box, having three ribs on the bottom, a wooden bottom board would be placed on the foundry floor. Then the pattern, bottom down, would be laid on this board, and sand would be filled in and rammed in the usual manner. A roll-over board would be placed on top, and flask hooks would be put around the outside to clamp the bottom board to the flask and the roll-over board, and then the whole thing would be turned over ready to receive the cope. This method would be perfectly satisfactory in casting one or two pieces, but when 25 or 30 are to be produced, not every foundry is equipped with the necessary number of boards.

By a simplified method, illustrated in the drawing, all these boards, the clamping hooks, the rolling of the flask and the extra labor are eliminated, the molds being made in a few minutes by a laborer. The first operation is the filling in of the bottom or drag flask with sand, which is rammed and then struck off; the next is the filling, ramming, and striking off of the pattern, which is then inverted and placed on the sand bed at about the center of the flask; the pattern is settled down by a few strokes of a hammer on the bottom, and the cheek of the middle flask is put on the drag, filled with sand, rammed, and struck off flush with the bottom of the pattern. The cope flask is next placed on the cheek flask, and sand is filled in, rammed, and vented in the usual way. Afterward the cope is lifted, the pattern drawn out, and the cope replaced, thus finishing the mold. The molding of this pattern can be done in a two-part flask, cope, and drag by filling in about enough sand to bring the pattern flush with the top of the drag, as shown by the lower dotted line.

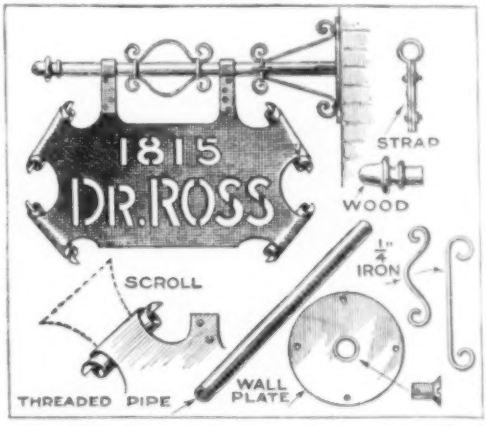



**Method of Making Molds for a Number of Cast-Steel Annealing Boxes, in Which Bottom and Roll-Over Boards, Clamping Hooks, and Rolling of the Flask are Eliminated**

**Under no conditions should acetylene be used where the pressure is greater than 15 lb. per square inch.**

## Perforated Business Signs of Sheet Metal

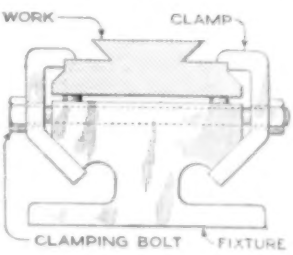
The drawing shows a neat type of small sheet-metal sign on which the letters, instead of being painted, are cut out. Sheet brass is preferable for such signs, although black iron will answer. The letters may be cut out with a chisel or with a jeweler's metal-cutting saw. The sign is supported on a horizontal bracket, made of pipe, to which it should be rigidly attached, as a swinging sign becomes very noisy. The advantage of a sign of this type is that it is effective by night as well as by day, as any light from the opposite side will cause the letters to stand out distinctly.




**Effective by Night as Well as by Day, a Sheet-Metal Sign with Cut-Out Letters Is Attractive, Is Not Hard to Make, and is Easily Read**

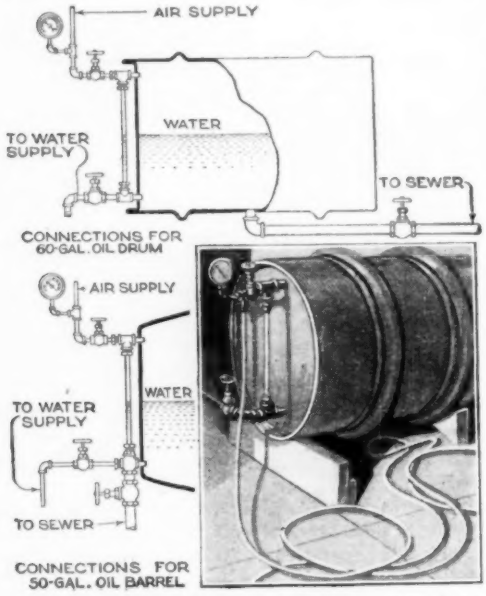
## Planer Clamp for Awkward Pieces

In order to clamp down irregularly shaped work quickly and firmly, the fixture shown in the drawing was made, reducing materially the time formerly required to set up the pieces on the planer. Two clamps of the shape shown were made and bolted to a special holding block. The work rested on the short pins, and the ends of the clamps were machined to fit over it. When the bolts were tightened, the work was held with an even pressure on both sides. The fixture was bolted to the bed of the planer in the usual manner.



### Homemade Air Compressor

Where a small volume of air under pressure is wanted, as for operating blowpipes or inflating tires in a bicycle shop




**Air under Pressure for Blowpipe Work or for Other Purposes, is Furnished by a Simple Air Compressor Made from an Empty Oil Drum**

or private garage, a serviceable air compressor can be made from a steel oil drum or barrel that is free from leaks. It should be placed in a horizontal position with the large 2-in. side opening, or bunghole, down, in the case of the drum. There are also two openings tapped for ¾-in. pipe in the head of a 60-gal. drum. The lower opening is connected to the water system, using a suitable valve for regulating the flow of water. The bunghole is the drain, and is connected to the sewer. To operate, the water is let into the drum, forcing the air out under the same pressure as that in the water system. When the drum is nearly filled, the water is shut off, the air valve opened, and the drum drained, ready for repeating the operation. A pressure gauge and gauge glass can be added, as illustrated, although neither is necessary.—H. C. Rowell, Hudson, N. H.

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¶A broach should only be used in work for which it is designed. If the broach is to be used for work of varying length, the broach maker should be given this information. Then, if the variation is not too great, the broach may be designed to meet the conditions.

### Shrinking Oversize Bushings

Frequently, in lapping hardened steel bushings, the hole is accidentally lapped too large. It may also happen, after lapping to size, that the hole has not cleaned up, and the bushing must be scrapped. However, by the method of rehardening described, the hole can often be shrunk sufficiently to make a new bushing unnecessary. Turn up a piece of machine steel in the lathe, about .004 or .005 in. under the size of the hole in the bushing. Leave a shoulder on one end of the turned piece, place the bushing over the small end and reharden, quenching the shoulder end first. The water or quenching solution cools the outside of the bushing first and shrinks the hole several thousandths, allowing more stock for relapping.

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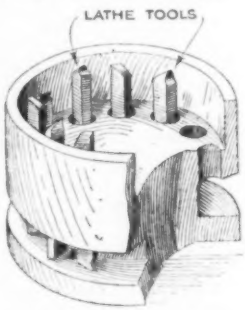
### Holder Protects Cutting Tools

The practice of throwing tool bits into a pile in the most convenient place is admittedly bad, but the lack of some simple yet efficient holder is, in most cases, responsible. The type of holder adopted in many shops is an oblong or square wooden block drilled with rows of holes, in which the tools are placed. Most lathe operators grind tool bits on both ends to save time, and this custom makes it necessary to lift each tool from its hole when searching for some particular type or shape, which may be concealed on the bottom end of a bit. Another objection to a holder of this kind is that, when filled with tools, it presents a dangerous surface, bristling as it does with sharp-pointed tool bits, which may cause severe cuts on the arms and hands of the operator when reaching across the tray.



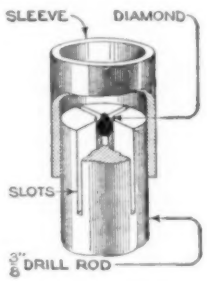

The holder illustrated is as cheap to make as that described above, and it has the double advantage of being perfectly safe and of presenting both ends of the tools to view at the same time. A piece of hardwood is turned to a diameter of about 4½ in., one end is hollowed out, and a groove is machined near the bottom. About a dozen ½-in. holes are drilled, as shown, to accommodate the ⅜-in. square tool bits, and the holder is

complete. The depth of the holder should be greater than the longest tool bit used. It will be apparent that, with the upper ends of the tools protected by the edge of the holder, injuries due to contact with the sharp edges and points are impossible, and that both ends are clearly visible as the holder is revolved.

### Resetting Diamonds in Wheel Dressers

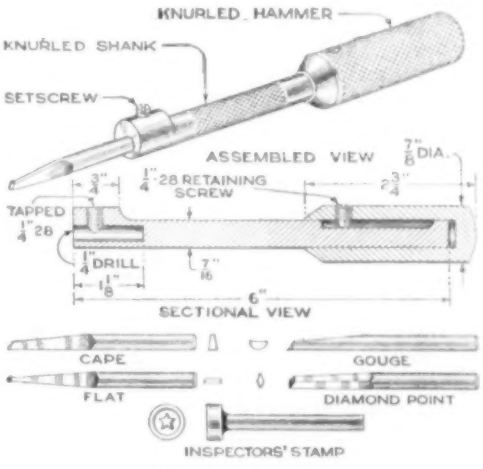
In tool and grinding rooms, where diamond-pointed emery-wheel dressers are extensively used, it is not an infrequent occurrence that a diamond becomes loose in its holder; it should be reset at once to prevent it from coming out entirely, with the possibility of its becoming lost.

One of the best methods of resetting such a diamond is illustrated by the drawing. A piece of standard-size drill rod is obtained, and a hole the size of the diamond is drilled in the end to a depth of about ⅛ in. Next, crosscuts are made with a hacksaw, as shown in the drawing, to a depth of about ⅜ inch. The diamond is then placed in the hole, and the edge of the hole is slightly riveted over, to prevent the stone from coming out. A machine-steel sleeve is made to fit tightly over the end of the drill rod; this sleeve is made long enough, so that when pressed in place it will cover up the hacksaw slots and extend beyond the end for about ½ in. The diamond is now ready for brazing in, and the sleeve is filled with borax and spelter; when heat is applied, this melts and flows down, packing solidly around the diamond. Add more spelter until the sleeve is full, and be sure to keep it at a good heat for about a minute after the sleeve has been filled. Then the sleeve and surplus spelter can be turned off in a lathe.—Chas. Homewood, Ontario, Calif.




### Self-Contained Hammer and Chisel

There is nothing quite so unhandy to hold and work with as a small chisel. Many and hard are the knocks the workman receives on the fingers and knuckles when chipping in confined places and difficult corners. Even on work easily reached by hand, it is a ticklish job to chip a slot or small keyway if the chisel must be held by hand. The "hand gun" illustrated was designed to overcome this, and is extensively used on fine tool and die work. With it, there is less abuse of the tools, and by using bent and shaped




**A Combination of Hammer and Chisel That Makes Chipping and Tooling in the Confined Corners of Tool and Die Work Comfortable**

chisels, some work can be done that would otherwise be considered impossible.

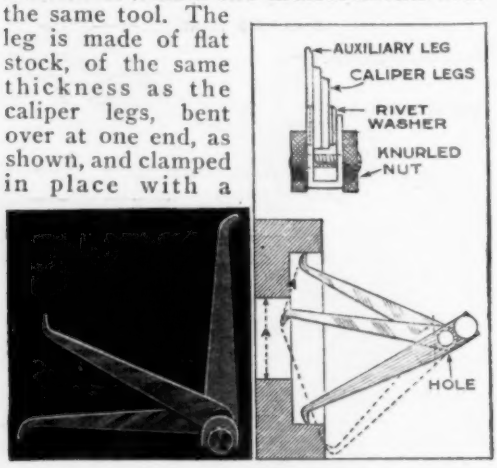
The shank of the tool is made of drill rod, turned to the dimensions shown, the center is knurled for a good grip, and a flat is filed, or a groove cut, near the rear end. The hammer sleeve slips loosely over the end of the shank, on which it is retained by a small screw; this part is also knurled and has a polished round end.

In use, the chisel is fastened in the head, and the shank of the tool is held by the left hand. The sleeve is drawn back, and then brought sharply forward, with the desired degree of force. Any weight of blow can be obtained, though for light work it is sometimes desirable to provide a smaller and lighter hammer sleeve. The chisels are made of ¼-in. drill rod, ground or filed to shape, and of various widths and sizes to suit the work in hand. Inspectors' stamps can also be made up to fit the tool, and, so used, will save time and trouble. Commonly, either the stamp or the hammer is mislaid, and holds up the inspection; with both combined into one tool, this is not likely to occur.

¶Scissors sharpened with too much bevel will not hold their edge, but if sharpened to an angle of 30° or 35°, the edge will hold for a long time.

## An Auxiliary Caliper Leg

An extra leg on a pair of inside calipers is handy in many instances, as it enables the user to obtain two measurements with the same tool. The leg is made of flat stock, of the same thickness as the caliper legs, bent over at one end, as shown, and clamped in place with a knurled screw and nuts. The leg is drilled to fit over the joint washer, upon which it swivels. In the illustration, the calipers are shown set for two inside dimensions, but they can be used also for inside and outside measurements by turning the auxiliary leg around. In use, the calipers proper are set first, and the auxiliary leg afterward. As an effective means of reducing the number of tools required on a job or as a handy method of finally testing dimensions before removing a piece of work from a machine, the auxiliary caliper leg is worth the time required to make it.




**Two Measurements can be Taken at the Same Time with One Pair of Calipers by Attaching an Easily Made Auxiliary Leg**

## The Strength of Fiber Boxes

The direction in which the fibers run in fiber-board boxes has been found to have a considerable effect upon the life of the boxes. Fiber-board does not tear as easily across the grain as with the grain; it may have two or three times as much strength in one direction as in the other, the difference varying with manufacturing conditions. This excess strength may be used advantageously to reinforce the weakest points of the box and so produce a more perfectly balanced construction.

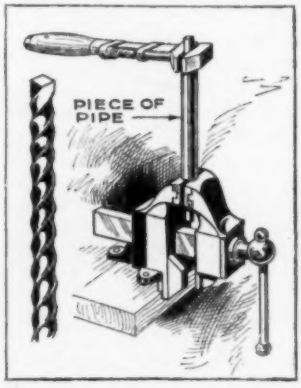
The weakest parts of fiber boxes are the scores, or folds, forming the edges of the box. It is impossible to have the fibers running perpendicular to every score, but usually they may be made to run perpendicular to the scores that receive the hardest usage, or that tend to break open first. The location of the scores most likely to fail, of course, varies with the shape of the box and the nature of the contents, and can be best determined by test.

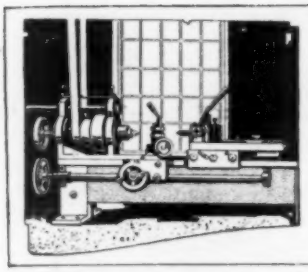
In a test on fiber boxes, some were packed with 2 doz. food cans, and some with 4 doz. tall milk cans. It was found that the first break nearly always occurred in the horizontal end scores. By making up the boxes so that the fibers ran vertically instead of horizontally, on the sides and ends, the first break in the horizontal end scores did not occur until the boxes had been under test almost twice as long as before, and the horizontal side scores, which received the next hardest usage, were so strengthened that they never failed until some other part had first given way.

The gain in strength of the horizontal scores was, of course, accompanied by a weakening of the vertical scores. But since the upright scores are not ordinarily under as great strain as the horizontal scores, and in these tests were not as likely to come in contact with the sharp edges of the cans, they were able to stand a reduction in strength and yet not become the point of first failure.—U. S. Forest Products Laboratory, Madison, Wis.

## Twisting Iron Bars

The occasional worker in ornamental iron often finds it difficult to twist two round bars, or a square one, so that the resulting piece will be straight and the pitch of the twists uniform. By applying the idea illustrated, however, excellent results may be obtained. One end of the bar to be twisted is clamped in a vise and a close-fitting piece of pipe is slipped over it as shown, allowing the upper end of the rod to project beyond the pipe. This end is seized in a wrench, which is used to twist the rod.—W. Norman Fox, Atlantic City, New Jersey.





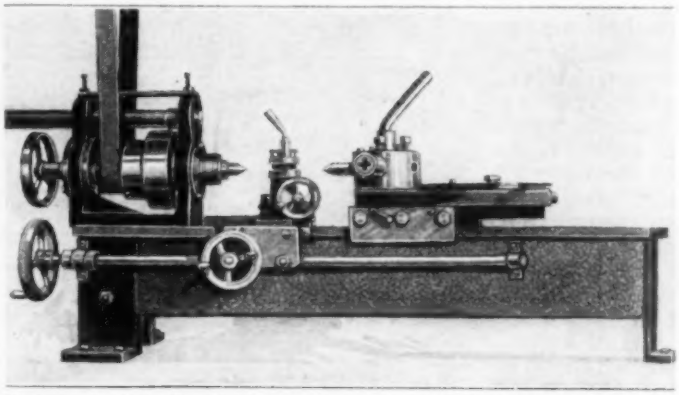
# BUILDING A SIX-INCH TURRET LATHE

By J. V. ROMIG

[Arrangements have been made to supply the necessary castings for this lathe, at a low figure, to any who are interested. This magazine has no financial or other interest in this, beyond that of service to the reader. The name and address of the maker will be furnished, upon request, by the Shop Notes Department.—Editor.]

WHILE the turret lathe is essentially a tool for the production of work in large quantities, a 6-in. lathe of the type described in this article will be found exceedingly useful in the small experimental shop. With a center held in the main turret, the machine may be used as a simple engine lathe, and when a number of similar pieces are to be turned out in a hurry, the work may be performed in almost as expeditious a manner as on a commercial turret lathe.

This machine was built and used by the author in his own workshop, on fine precision work, and many accurate jobs have been done with it very quickly. Most of the work of building can be done in a workshop equipped only with a vise and bench drill, with the necessary small tools, as flat cold-rolled steel is used for the ways, carriage, and other parts of that character; it will be necessary, however, to have certain things, such as the machining of the headstock and the cutting of the feed screw, done in a machine shop, but this is a small item.



Photograph of the Completed Lathe as Used in the Author's Workshop: It Is Capable of Performing Both Fast and Accurate Work

The headstock is made of gray iron, and is fitted with an overarm steadyrest, which allows the carriage to travel the full length of long work, as the work is supported from the top and rear. The spindle is carried, at the rear, by a double-row ball bearing, .75 in. wide, of the combined axial and radial-load type, and at the front by a single-row bearing, .629 in. wide. Both of these bearings have an outside diameter of 2.441 in., and an inside diameter of 1.181 in. Care must be taken to bore the bearing housings a push fit for the bearings, and to have all faces square and parallel with each other.

The spindle should be made of a good grade of steel, of about .3-per-cent carbon content, and is hollow. It is best to bore the spindle first, then re-center and finish the outside. The nose is taper-bored to take the collets, and threaded eight threads per inch, U. S. standard, to fit the faceplates and chucks. The taper seat for the collets should not be finished until the lathe has been completely assembled; it should then be machined with tools held in the toolpost of the lathe itself.

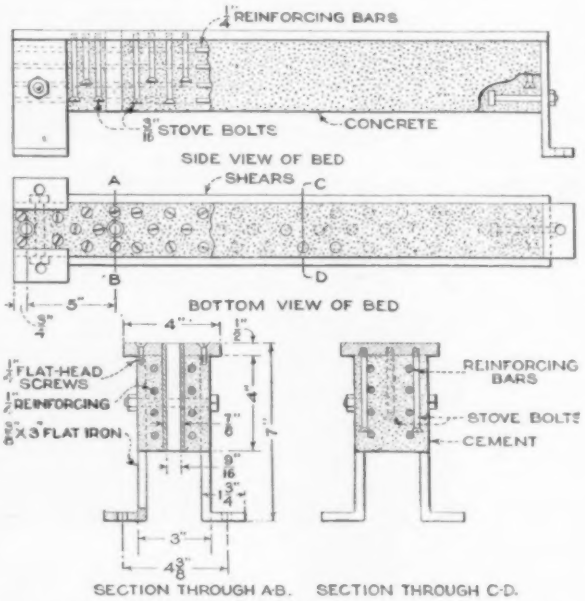
The inner races of the ball bearings should be a good fit on the flat threads on the rear of the spindle, and on the outside of the spindle at the front. Bearing-retaining rings are fitted at the rear, clamping the outer race of the bearing firmly, and taking up the end thrust. These are fitted with felt dust rings, bearing on the collars on the spindle; the rings at the front are also fitted with dust rings, running on the spindle, but these rings do not clamp the single-row bearing, which is permitted to float.

When the headstock is assembled, the bearing housings should be packed with a good grade of vaseline, which will last a long time; see that the vaseline supply is at all times sufficient for good lubrication. Spindles fitted in this manner are far superior to those fitted with plain bearings, as they consume less power, are free from vibration, and allow of accurate as well as heavy work. The writer has

taken a ⅛-in. cut on a piece of ½-in. cold-rolled steel at a distance of 5 in. from the collet, the reduced diameter being very accurate as to size.

The drawbar for the collets is a tube, the outer diameter of which fits the bore of the spindle. It is threaded at the front to fit the collets, and is fitted with a handwheel at the rear. A tiebar at the top of the headstock keeps the two arms stiff and rigid. The cone pulley is fastened to the spindle by a setscrew, spotted into the spindle; two cone pulleys, of the same size, should be cast and machined, one being used on the countershaft. The arm for the steadyrest is a length of 1-in. cold-rolled steel; it is clamped in position by ⅜-in. capscrews, which compress the slotted headstock arms. The headstock is fastened to the bed by two ½-in. bolts, running up through pieces of pipe cast into the bed; by this means no strains are put on the cement.

The construction of the bed is somewhat of a novelty, although it has been thoroughly tried out by the writer in this and other machines, and found to be very satisfactory. This method of making the bed eliminates the hardest work of making a small lathe, as it does away with the bed casting and the necessary machining.

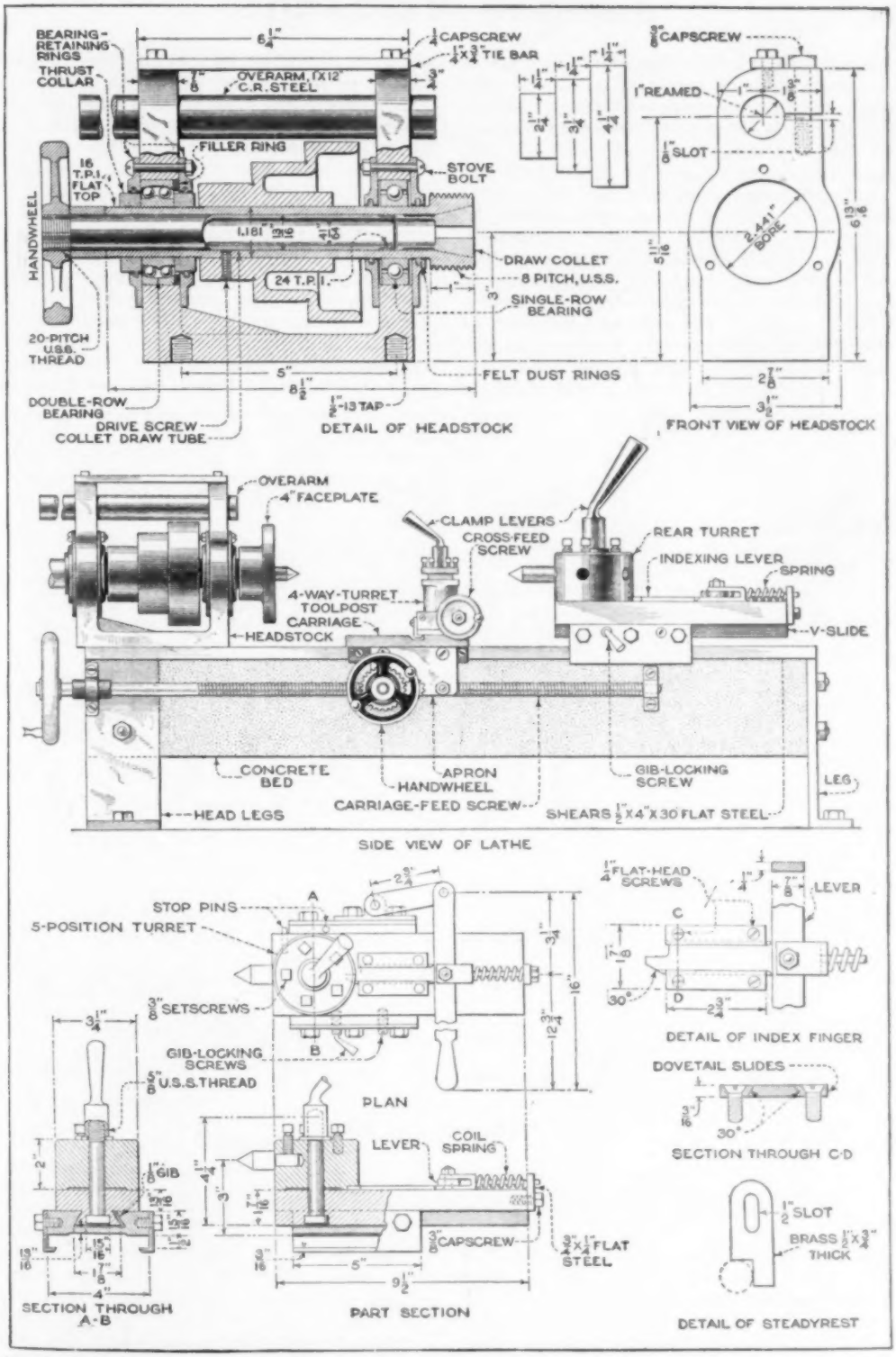



**Method of Making the Bed: The Bolts for the Rear Leadscrew Bearing are Not Shown, but should be Cast In like the Leg Bolts**

A piece of ½ by 4-in. cold-rolled steel, 30 in. long, is used for the shears. This is first drilled and tapped for a number of 3/16-in. stove bolts, of varying lengths, which are used to anchor the shears to the cement, also drilled and countersunk for the leg screws and for the ½-in. headstock bolts. It is next carefully straightened and scraped to a true surface on top and sides, testing the width throughout with a micrometer, and using a knife-edge straightedge on the surfaces; these must be as true and straight as it is possible to make them, as upon their truth depends the accuracy of the lathe. When trued, all surfaces should either be frosted or polished.

The shear anchor bolts should now be screwed home, the pipes, leg and rear leadscrew-bearing bolts placed in position, and a wooden form made to fit closely around shears and legs, in which to pour the cement. The cement used is a mixture of one part Portland cement to three parts clean, sharp sand, mixed with just enough water to enable a handful of the mixture to be picked up and squeezed and to leave the impression of the fingers in it. This cement is tamped down firmly in the form, poking it around the screws and into the corners with an ice pick, or some similar tool. When the concrete has set thoroughly, the boards are removed and the cement thoroughly wetted twice a day for about a week; this will temper the cement, and is a very important part of the work. The resulting bed is as strong as anyone could wish. Reinforcing rods may be laid down in the cement, as it is being placed, or wires twisted throughout the bolts, adding further to the strength of the bed.

The main member of the carriage is made of cold-rolled steel, ½ by 5 by 5¼ in. in size, machined as shown in the carriage-detail drawing. A piece of ¼ by 2-in. cold-rolled steel, 7 in. long, is fastened to the top of the main member by 3/16-in. screws; on this piece the cross slide runs. The cross slide is also made of steel, machined as shown, and is fitted with a turret toolpost. The cross slide is held to its ways by means of angle pieces, as shown in the front view of the carriage. The turret is made of steel, and is casehardened; four tools can be

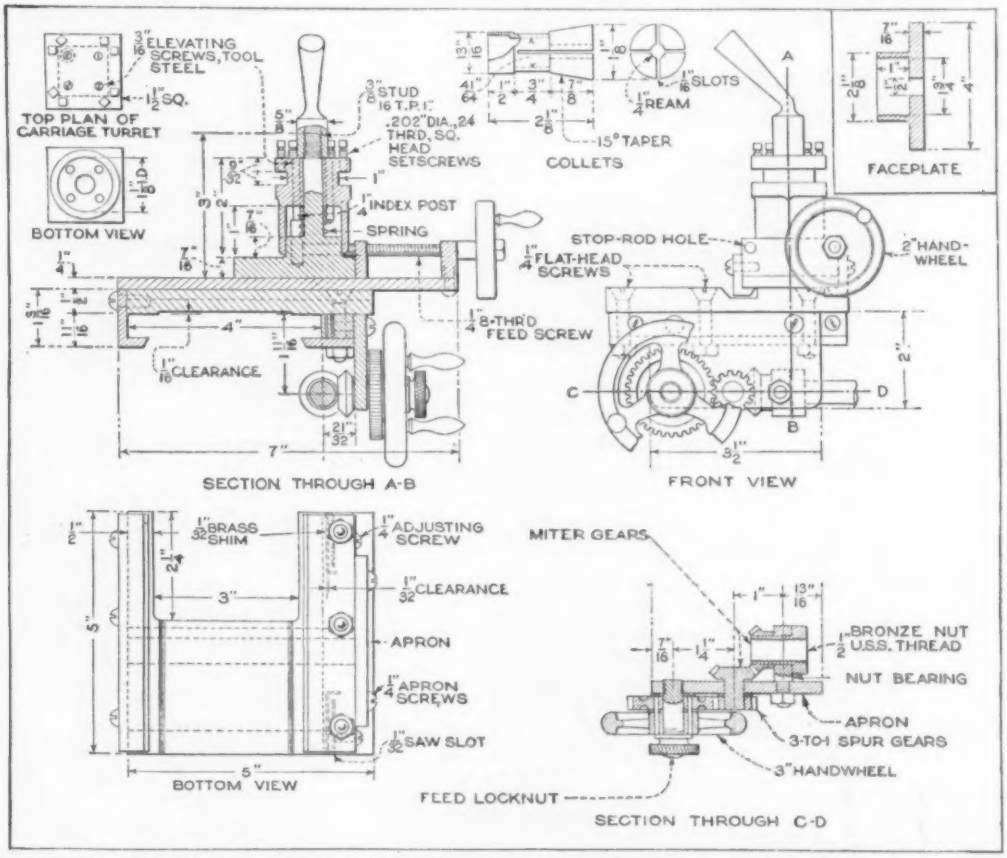



**Details of the Headstock and Main Turret, and Side Elevation of Completed Lathe: When a Center is Used in the Turret, as Shown, and the Gib-Locking Screw Tightened, the Tool can be Used as an Ordinary Bench Lathe, for Turning Work between Centers. Five Tools can be Used in the Main Turret, and Four in the Toolpost Turret, Making for Speed in Production**

mounted in this at once. On the boss of the cross slide is mounted a small index post, into the countersunk top of which the elevating screws fit, allowing each tool to be adjusted to its correct cutting height. A spring pushes the turret upward when the clamping handle is loosened, allowing the turret to be turned to bring another tool into cutting position. A ¼-in. square-thread screw operates the cross slide, and the tools are held in the toolpost by ¼-in. square-head setscrews.

The apron of the carriage is made of steel, 2 in. wide, and is fastened to the main carriage member by flat-head machine screws. The front angle piece of against the edge of the shears. Brass shims, or wearing pieces, 1/32 in. thick, are set in the ends, to take the wear on the filler piece. The rear angle is plain, machined as shown in the drawing.

Behind the apron is fitted a bronze nut; this rotates in a bearing fastened to the apron, and is screwed into one of a pair of miter gears, which, in turn, are driven by 3-to-1 spur gears; the larger gear is pinned to the handwheel, and the smaller is pressed onto the hub of the second miter gear, which runs in the apron. The handwheel runs on a stud screwed into the apron; this stud is fitted with a knurled friction nut, so that, if




**Full Details of the Carriage and Apron Mechanism: Note the Employment of the Small Index Post and Elevating Screws in the Toolpost to Secure the Correct Height for Each Tool. The Post is Set in the Inner Left-Hand Corner of the Turret Base**

the carriage is built up, as shown, the filler piece being slit at each end, so that wear may be taken up as it develops, by tightening the adjusting screws. The holes for these screws do not go clear through the filler piece, but stop at the slits, so that, by screwing the screws in, the inner ends of the filler are pressed

change gears are fitted to the lathe or it is desired to feed by means of the handwheel on the end of the leadscrew, the nut can be tightened and the whole assembly of spur and miter gears and nut locked firmly.

The rear, or main-turret, base and slide are made of cast iron, a dovetailed slide

being used, fitted with a ⅛-in. gib. The front gib-adjusting screw is fitted with a handle and is used to lock the turret in position for plain turning operations. The turret pivot pin, of cold-rolled steel, casehardened, is ⅝ in. in diameter, with a ⅝-in. U. S. standard thread cut on the upper end, and fitted with a clamping handle. The turret is made of steel, undercut as shown in the drawings, and has five equally spaced slots milled around the lower surface for the index finger. One side of each slot is radial, the other being tapered, and the index finger is made to correspond. By making the finger and slots of this form, the radial side does the actual locating, and the tapered side moves the turret to position; only the radial side need be of great accuracy, while the wear is chiefly on the inclined side, where it does no harm.

The holes for the tools should not be bored until the indexing mechanism has been assembled and the lathe set up; then, by boring the holes with a tool held in the chuck, and correctly supported, the greatest degree of accuracy is obtained. The details of the indexing device are so complete that little description is necessary; care should be taken, however, to see that the coil spring is heavy enough to prevent the index finger from being withdrawn from the turret until the stop pin on the back of the turret base strikes the pin on the slide; the backward movement of the lever will thus move the whole turret back until the stop pins engage; further movement disengaging the index finger, and allowing the turret to be revolved to the next position. The index finger slides between beveled strips of 3/16-in. steel, and must be a good fit; both slides and finger should be casehardened to insure long life.

The speed of the lathe, and the arrangement of the countershaft, will be determined by the work to be undertaken and the shop conditions. A reversing countershaft should be fitted if tap and die work is to be performed on the lathe. A quadrant and stud can be fitted on the head end, and a set of change gears provided, if the lathe is to be used for screw-cutting; in this event, no care should be spared to secure an accurate leadscrew.

The builder of this lathe will have a very efficient machine, one that could not be purchased for many times the cost of building.

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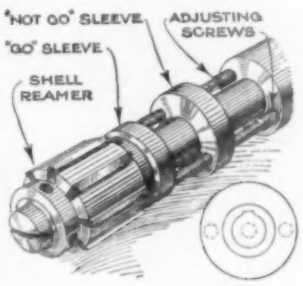
¶A round file and a monkey wrench make an excellent pipe wrench in an emergency.

### Combined Reamer and Gauge Holder

For various reasons an adjustable reamer may cut larger or smaller than the size to which it has been set. This demands careful gauging to avoid a number of spoiled pieces with a consequent loss in time. In the drawing is shown a holder that gauges the work as it is finished. The expansion-shell reamer shown is 1½ in. in diameter, and is used to ream out cast-iron rings that vary from 2 to 5 in. in width. The reamer is held in the ordinary manner, and two sleeves, or rings, are made a running fit on the holder. One sleeve, used as the "go" gauge, is left plain, the other, or "not go," is tapped for two knurled-head screws. The go gauge is always held in a position just behind the reamer, but the not-go gauge can be set by means of the knurled screws to various positions to suit the width of the rings. When the work is reamed, the go gauge enters before the reamer passes through and shows that the hole is above the low limit, and if the not-go gauge fails to enter, the hole is right. Being loose on the holder, the gauges cannot score the work, as they revolve with it. The shank of the holder as well as the gauges should be casehardened and ground to size.

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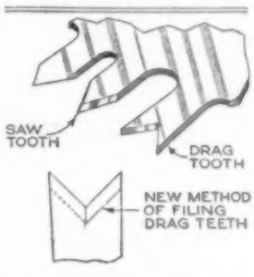
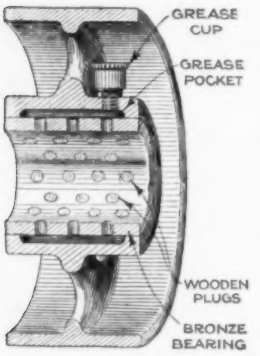
### Filing the Crosscut Saw

The drawing shows a new method of filing a crosscut saw in such a manner as to make a bevel on each side of the drag tooth, similar to that of the cutting tooth. When filed in this manner, the drag quality is not impaired, while the cutting speed is considerably increased. When filing the teeth in this manner, the drag should be almost as long as the cutting tooth, but never set as the cutting teeth are.—Elmer Hufferd, Rushville, Ind.



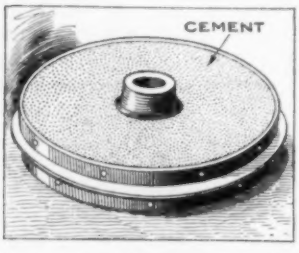
### Oiling Loose Pulleys

Inadequate lubrication of loose pulleys causes excessive wear on countershafts and necessitates frequent rebushing of the pulleys, and to keep the ordinary loose pulley well lubricated requires considerable more attention than can be given it in the average shop where no oiler is employed. The drawing shows a method of lubricating that has been adopted by a large shop. The pulleys are bored for an oversize bushing, and recessed to form a grease pocket around the hub. Bronze bearing metal is used for the bushings, which are pressed into the hub. Before taking the finishing cut on the bushings, ⅛-in. holes are drilled in them, as shown, and plugged by driving in hard-maple pins; the finishing cut turns these flush with the bearing surface. After placing the pulley on the shaft, the annular pocket is filled with a good grade of light grease. The pulleys are well oiled when first placed on the shafts; afterward the grease works down through the plugs and good lubrication is insured.—Lowell R. Butcher, Des Moines, Ia.



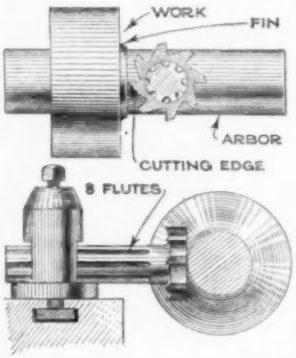

### Increasing Weight of Tractor Front End

My first experience with a tractor was in the days when the designs were created more by guess than by practical experience, and my first tractor would act more like a balky horse than most of the present-day tractors do. Not that it refused to go so often, but when it was overloaded, it tried to turn a back somersault. I decided to break it of this habit, and found that I could do so by filling the front wheels with cement. To do this, the wheels were removed and placed over a concave depression scooped out of the ground to the form desired, and a place was also provided for the hub to lie in. Then the space between the rim and hub was filled with a mixture of one part cement to four parts sand, and troweled off on top. The extra weight amounted to about 350 lb., and was sufficient to hold the front end down. Making the front wheels solid in this manner not only provided the extra weight required, but made it easier to turn in loose ground and to steer.—G. G. McVicker, North Bend, Neb.




### A Novel Facing Tool

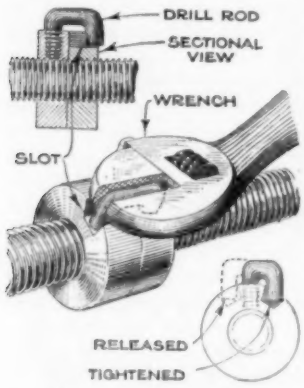
Every shop has a collection of soft arbors, usually well decorated with cuts and small burrs, all along the surface, caused by careless operators who dig into them with the tool when facing work. This uneven surface is very apt to seize the work as it is being driven off, with the result that the hole will be roughed up and probably spoiled. Hardened arbors do not suffer in the same way, but they dull the tool immediately if the operator feeds it in a little too far. The facing tool illustrated can neither dig into a soft arbor nor be dulled by contact with a hard one, and once made, will last a long time, as it possesses eight cutting edges. The drawing shows clearly the shape of the tool; it is made somewhat like an ordinary milling cutter, but the front face is left perfectly flat, only the backs and faces of the teeth being backed off. Milled along the shank are eight half-round grooves, the centers of which are in line with the cutting edges. The work should be roughed down with an ordinary round-nose tool until close to the desired length; this will leave a rough fin to be removed by the facing tool. The tool is gripped lightly in the toolpost, the point of the toolpost screw entering one of the grooves in the shank, which brings one of the cutting edges in the right position. The tool is then moved in until it touches the arbor and lies flat against it, when the former is tightened up. The fin is removed in one side cut, and the tool fed outward in the final finishing cut. It will be seen that the tool cannot dig in



or be dulled by contact with a hardened arbor as the wide, plain face prevents this, and since it involves only one change of tools, as with the ordinary tool, it is worth making as a saver of arbors.

### Quick Nut-Locking Device

Two nuts, locked together on a threaded bar, are used on many machines as a means for holding some part at a required setting; some makers of milling machines use this method to set the travel of the table, while on many hand-screw machines, turrets and cross slides are set by the same method. The use of two wrenches is required to tighten or release two ordinary hexagon nuts, with the danger of slipping or altering the setting by unequal pressure. The device shown enables two nuts to be locked together with one wrench easily and without fear of the setting being disturbed while so doing. Instead of the usual hexagon, the nuts are made circular, one being drilled and tapped on the outside, while the other has a slot cut into its circumference. A piece of drill rod is threaded to fit the tapped hole in the first nut and bent over as shown, to fit into the slot of the second. The following method will determine where the slot should be cut: Screw both nuts onto the bar on which they will be used; tighten them up, face to face, until they move freely together, and then scribe a line through the center of the tapped hole and across the other nut to mark the center of the slot. When this is cut, as shown, and the bent drill rod put in place, both will, of course, screw onto the bar in the same position; they can then be moved to any adjustment by hand and tightened with a single wrench by moving the bent rod as shown. The nuts are released by moving the U-shaped drill rod in the opposite direction.



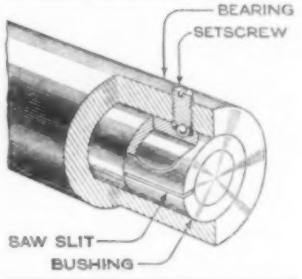

¶When milling aluminum, use kerosene as a lubricant.

### Keeping the Soldering Flux Handy

When using the blowtorch for heating the soldering iron, or for soldering electrical connections, the worker often mislays the soldering flux, so that just when it is needed, it cannot be found, and time must be spent in hunting for it at the risk of "burning" the copper bit. This can all be avoided by attaching a small container between the handle supports of the torch. The flux container can easily be made removable, but the best plan is to make it a permanent part of the torch, as it is never in the way, and is very convenient.

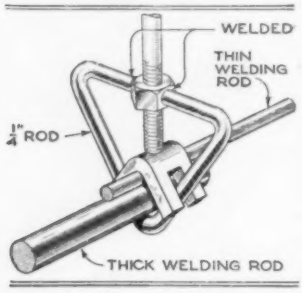
### Taking Up Play in Solid Bushings

Frequently, when the solid bushings of machine parts become too worn, they are discarded and new ones fitted. In cases where it is found impossible to get new bushings at once, a handy way to "doctor up" the old ones is shown in the drawing. A hole is drilled and tapped in the journal box right over the point of greatest wear, where the bore will be oval, in line with the pull of the belt. Allow the drill barely to spot the brass, and use a bottom tap to finish tapping the hole. After this operation, the shaft being withdrawn, slit the bearing with a hack-saw blade, holding the saw with the fingers if the frame cannot be used. Then drop a 1/16 or 1/8-in. steel ball into the hole, and screw in a cup-pointed setscrew. Pressure applied to the bushing by the screw will enable the worn part of the bearing to be brought into contact with the shaft and take up the play. The ball fits nicely between the bottom of the setscrew and the bottom of the hole, and keeps the bearing from turning. Where the bearing bushing is long, place two or more such screws along its length.



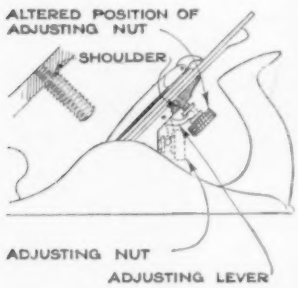
### Double Welding-Rod Holder

Acetylene welders will find many uses for the welding-rod holder illustrated. When a single-rod holder is used, the welder must lay down the rod he is using and grope around for the other as the work progresses. This can be avoided by holding the thick and thin welding rods in the same holder, and the one described can be made from scraps. An iron rod ¼ in. in diameter, is heated and bent to form one jaw of the clamp, the other being made from a piece of flat stock, bent and sawed out on the sides to clear the rod. An iron-pipe nut is welded between the ends of the ¼-in. rod, and a piece of pipe is used to tighten the welding rods in the holder and serve as a handle. The different sizes of rods extend in opposite directions, so that it is only necessary to turn the holder around to bring either rod into use.




### Making the Plane Adjustment Easy to Reach

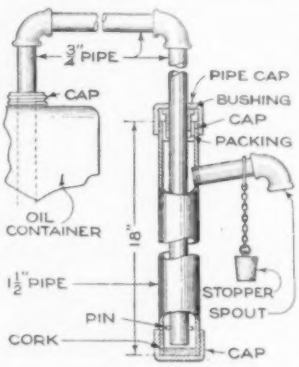
The drawing shows how a woodworkers' plane of a familiar type was rearranged to bring the adjusting screw within easy reach of a short-fingered workman. The screw was removed from its original position, as shown by the dotted lines, and a shoulder was turned and threaded on one end, as in the detail. The pin holding the lateral adjusting lever was driven out, and a hole drilled and tapped for the shouldered screw. The end of the screw should project a trifle and be riveted over. In reassembling, the adjusting lever is reversed to fit into the nut, as shown. The job is a simple one, and when completed, the adjusting nut is right at the user's finger tips, so that he need not remove his hand to set the plane.
—M. E. Duggan, Kenosha, Wis.




### Siphon Pump for Heavy Liquids

A pump, suitable for oils and similar heavy liquids, that is self-operating when once started, can be made from ordinary pipe fittings.

The barrel, or other container, is elevated from the floor about 2 or 3 ft., and the cap or bung is drilled to take a ¾-in. pipe; this vertical length of pipe should extend almost to the bottom of the container and project about 4 in. from the top. An elbow and a horizontal length of pipe with another elbow is fitted to the first pipe, then a second vertical pipe, the end of which must come level with the bottom of the container, is screwed into the outer elbow. This last pipe is rubbed off with emery paper to make it smooth and round. A small hole is drilled through the lower end and a metal pin driven into it that will project about ¼ in. on each side.




The vacuum chamber, which starts the siphon, is made from an 18-in. length of 1½-in. pipe. Cap one end, which is the bottom, first lining the inside of the cap with a piece of cork. The top end contains the gland. This, as shown in the drawing, is made by first forcing a pipe cap down inside the end of the pipe and brazing the edges together. Drill a hole to fit the ¾-in. pipe in the center of the cap. Next, grind off the outside threads of a ¾ by 1-in. bushing, so it can be easily forced inside the cap. The outside flange of the bushing should not project over the outside edges of the pipe. Finally, drill a hole to fit the ¾-in. pipe in the center of a 1½-in. pipe cap, and screw that down over the pipe. With packing under the bottom of the bushing, the screwing down of the outside cap will force it outward and around the ¾-in. pipe, so that some effort will be required to move this vacuum chamber up and down on the pipe. The smoother the pipe and the better the packing is adjusted, the easier the chamber can be operated to produce the vacuum necessary to start a flow of liquid.

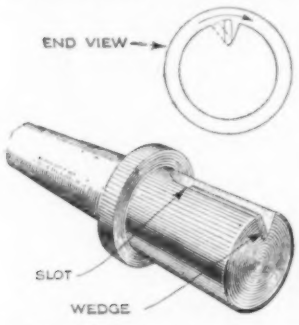
A spout, consisting of a short length of ¾-in. pipe, and an elbow, is screwed

into the side of the chamber, about a fourth of the distance from the top; this is given a slight upward angle to prevent dripping. Keep a cork stopper near by, to hold the vacuum in the chamber by closing the spout when not in use. Make all joints in the piping air-tight, and steady the line from swaying and undue vibration.

With the bottom of the vacuum chamber against the bottom of the pipe and the spout closed, pull the chamber down slowly until the fluid in the container is sucked into it. If the first stroke does not suffice to start a flow of the liquid, open the spout, push the chamber back up, close the spout and repeat until the liquid begins to flow. With the flow once started, the spout can be left open as long as desired, and the flow will continue until the container is exhausted. To stop the flow, it is only necessary to push up the chamber until the bottom of the pipe touches the cork. Only the liquid remaining above the spout will then flow out.—L. B. Robbins, Harwich, Mass.

### A Self-Gripping Arbor

A simple self-gripping arbor that is especially useful in facing up the bosses of brackets, links, or any work of a similar character, is shown in the drawing.



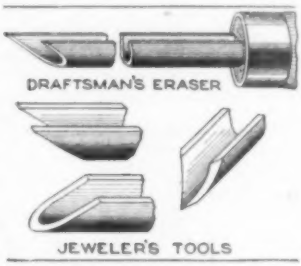

One end is turned to fit into the lathe spindle, while the opposite end is turned to the diameter of the hole in the work. Next, the slot is cut with a V-cutter and a wedge made to fit into it; the wedge is shaped as indicated, and should be of such width that, when the work is placed on the arbor, the wedge can just be felt when in the position shown in the lower view.

When the lathe is started, the work and wedge will move in the direction of the arrow, and the more pressure exerted against the work, the tighter the grip. To loosen the work, pull forward in the direction opposite the arrow.

**In milling steel, use oil liberally; the cutter will do better work and remain sharp longer.**

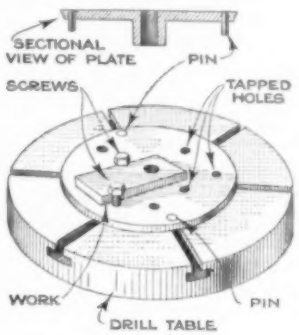
### Tools from Umbrella Ribs

The ribs of an umbrella frame are generally made of a good grade of steel, to give them elasticity and the ability to keep the covering tightly stretched, even in a wind. Excellent small tools for special purposes can be made from pieces of the ribs, and, as they can be hardened and tempered, may be made into small tools for the jeweler and engraver. A very good eraser for the draftsman can also be made from one of the ribs.




### A Handy Drill Plate

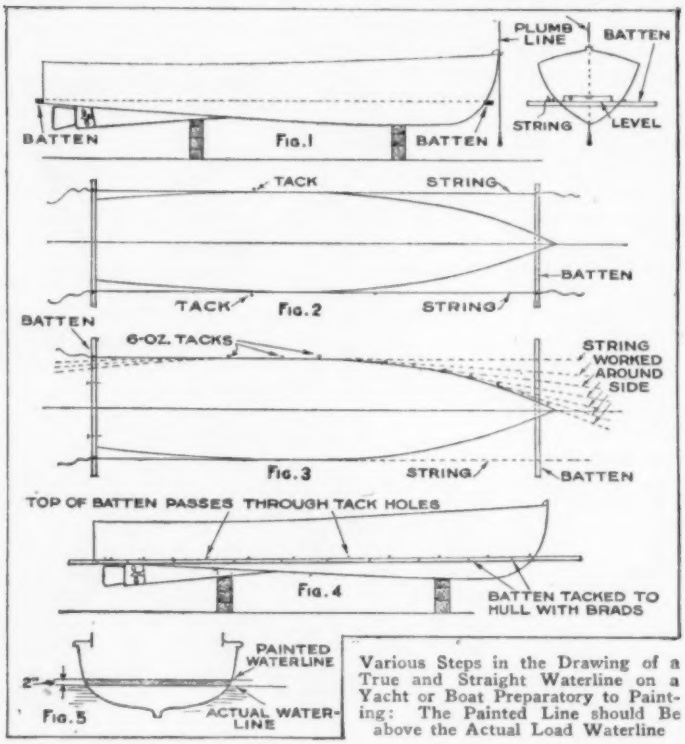
Many times work is drilled on a heavy drill press because there is no sensitive drill available, or because the work requires clamping to the table. In such cases, and a variety of others, the drill plate illustrated can be placed on the table of the heavy drill press, clamping the work, and saving the table from becoming pitted when the drill breaks through the work. The plate is made of cast iron, and the shank is turned to fit the hole in the table, the outside diameter being tapered slightly, to facilitate the removal of the plate. Two pins are driven into the plate, engaging the T-slots of the table to prevent the plate from turning, and a ½-in. hole is drilled through the shank. As the plate is cheaply made, holes can be tapped in any position desired, and when its surface becomes too deeply pitted, the plate can be scrapped and a new one substituted. Hexagon screws with larger heads than standard are handy as clamps, as they not only prevent flat pieces from flying around when the drill breaks through, but also stop the work from climbing up the drill, as it very often will if only a pin or stud, set into the drill-press table, is used as a stop.



## Drawing a True Waterline

After the height of the waterline has been determined at bow and stern, plumb the boat by hanging a plumb line directly in front of the stem, and aline the stem with this. Place a batten at right angles to the bow and stern at the proper height, level these with a spirit level, as indicated in Fig. 1, and fasten them securely. Tie the end of a chalk line to one end of the after batten, so that, when the line is carried forward, it will just touch the widest part of the hull, as in Fig. 2. At the point where the string strikes the planking, stick a small tack into the hull, directly under the line, and with one man carefully moving the forward part of the line inboard, or toward the hull as in Fig. 3, continue to insert tacks into the hull as the string strikes it, at intervals of about a foot. The string must not be moved too fast, as it will tend to follow the form of the hull, and crowd under. Continue in this manner until the stem is reached, and then work from amidships aft, repeating the operation on the opposite side.

The line of small holes made by the tacks should be plain enough to serve as a guide for the fastening of light battens on each side of the hull, as shown in Fig. 4. This batten should be in one piece, the whole length of the boat if small, about ¼ or ⅜ in. thick by ¾ in. wide, and planed so as to have at least one true edge and face. By tacking this batten with the true edge just "splitting" the tack holes, a straight waterline can be drawn. A hard pencil is good for marking the waterline along the top edge of the batten. The writer has used this method many times and has found it to be both simple and accurate.




Various Steps in the Drawing of a True and Straight Waterline on a Yacht or Boat Preparatory to Painting: The Painted Line should Be above the Actual Load Waterline

It has been my experience that, on small boats, from 25 to 50 ft. in length, it is always best to plan the painted waterline from 1 to 3 in. above the actual waterline, as this will keep the paint on the sides above the line from becoming fouled with dirt or growths of any kind. With this in view, the small-boat builder, if painting, say, 2 in. above the actual load waterline, as in Fig. 5, has a margin of about 40 per cent of the displacement of his boat to come and go on. With fair judgment, there is very little danger of getting this line too high.—J. Arthur Stevens, East Boothbay, Me.

## Danger in Directing Hose Stream onto Charged Wires

Recognizing the danger present when a stream of water is directed onto a heavily charged electric wire, a power plant in Washington, D. C., has marked the location of all high-potential wires and conductors with green lights. These burn continuously as a warning to firemen, in case a fire should break out, that the hose should not be used without observing the precaution of wearing heavy rubber boots and gloves. The significance of the green lights has been explained to the fire department and the information has been distributed to the several fire stations. This is an idea well worth copying in any plant where the same danger is present. The water serves as a path for the current to the ground.

# How to Make an Electric Soldering Iron

BY CURTIS RALSTON

MAKING an electric soldering iron, using a coil of resistance wire as a heating element, is, for several reasons, not a simple matter, yet if the right methods and materials are used, it is entirely possible to make a tool that will give very satisfactory service.

The drawing shows a sectional view of the iron. The dimensions given are not to be adhered to with any great accuracy, as the materials used will depend largely upon what is available. The heating element is intended to be wound with wire known to the trade as "No. 193 alloy," which can be bought from or through any electrical-supply house. The figures given for the resistance wire are based on the use of a coil about ¾ in. in diameter by about 3 in. long, so that if the copper body varies from the dimensions given, the amount of wire used will have to be changed accordingly.

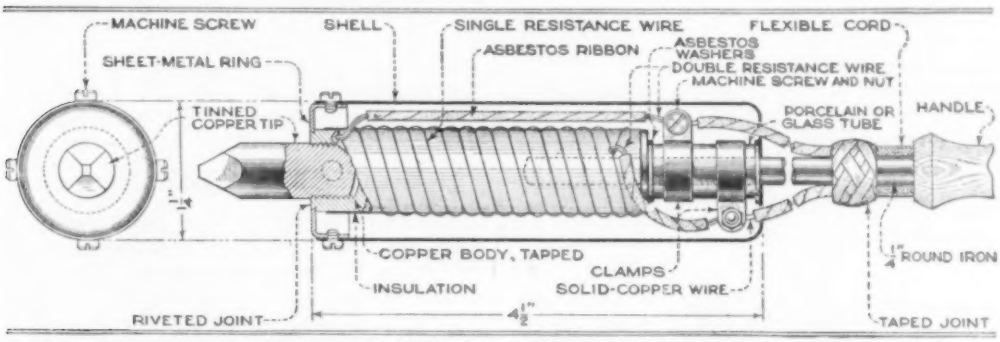
The main heat reservoir formed by the copper body is tapped out at one end so that copper tips can be screwed into it, making it possible to use a variety of tips.

Insulating the hot wire from the copper body is one of the biggest problems, since the insulation must be proof against the 110-volt electrical pressure, even at very high temperatures, and must also conduct heat easily from the wire to the copper body. The best insulator for the purpose is ½-in. asbestos ribbon, which can be bought from electrical-supply houses. Wind the copper body tightly with one or two layers of the ribbon, and then the resistance wire directly on it. A much better job will result if a little water glass (sodium silicate) is used as a cement on the asbestos. Besides providing mechanical firmness, the cement will greatly improve the heat conductivity of the asbestos, making the tip heat up quicker. An excellent heating element can be made by winding the resistance on a piece of quartz tubing. A piece of old clay pyrometer tubing is also good material, and even a piece of hard-glass tubing, such as is used for water-gauge glasses, will serve the purpose.

About 85 turns of No. 28 bare wire of the kind mentioned will be required, spaced about 28 to the inch, so that some kind of automatic feed will be found advisable for spacing the turns uniformly. This winding is designed to consume about 150 watts at 110 volts, which means a current of 1.36 amperes. Electric heating devices operate equally well on direct or alternating current.

In connecting the heating element to the lead wires, the suggestions given in the drawing should be closely studied. The ends of the resistance wire are brought out to two screws on insulated clamps; these are shown fastened around a piece of porcelain or glass tubing, but if plenty of asbestos tape is at hand, it will be just as well to wind some of it around the iron-rod stem of the tool directly and fasten the clamps on it. If the piece of tubing is used, some asbestos washers should be made and inserted between it and the copper body and steel shell, to prevent rattling.

It is important that the resistance wire should be brought out double to the clamp screws; otherwise it will get very hot at the ends as well as in the portion wrapped around the body. Doubling the wire provides a path of twice the conductance and reduces the energy loss in the leads. These doubled portions of resistance wire, as well as the copper leads brought in, should be wound with asbestos tape. Do not use rubber-insulated lamp cord for the leads into the shell, as the rubber




An Electrically Heated Soldering Iron That is Provided with Means for Using Interchangeable Copper Tips for Different Kinds of Work: Such a Tool can be Used on Any 110-Volt Alternating or Direct-Current Circuit with Very Satisfactory Results

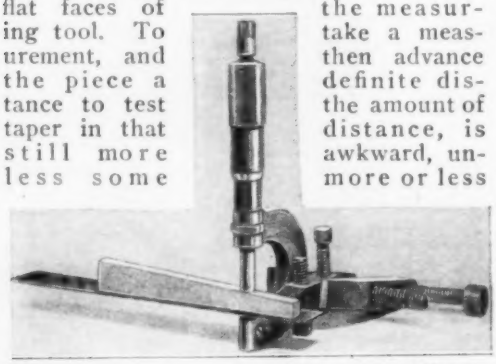
will burn off. Use No. 16 or 18 solid-copper wire, and solder it to the flexible cord at a point well back from the hot shell. This point must be far enough back so that the shell can be slid off without striking the taped joint, when the four small screws fastening it to the ring are removed.

It should be noted that the winding data given are not to be considered final; they are suggested only as a starting point in making the first heating element. So many factors enter into this question that it is impossible to say, without repeated trials, just how many watts can be safely drawn by a soldering iron. If it is found that the iron does not get hot enough to melt solder in less than 10 minutes, fewer turns of the wire should be used or some of the windings short-circuited. If the tip gets hot enough to melt solder in less than three minutes, or the element burns out, or if the water glass seems to be acting chemically on the resistance wire, then too much energy passes through it, and more turns or smaller wire must be used.

In using any electrical heating device, care must be taken not to leave the current turned on when not in use, and some kind of stand or rack should be provided on which to set the iron down when hot.

## Micrometer Attachment for Measuring Tapers

Measuring tapers with a micrometer is always an awkward job, owing to the unsatisfactory surface presented to the flat faces of the measuring tool. To take a measurement, and then advance the piece a definite distance to test the amount of taper in that distance, is still more awkward, unless some more or less expensive device is used. The illustration shows a method that gives very accurate results without requiring any addition to the machinist's tool equipment. To obtain correct alinement, a rule is clamped to the top of the micrometer anvil in the following manner: The micrometer spindle is first brought down until the scale is held between spindle and anvil, exactly as though the scale were being measured. A small clamp is then pressed close to the side of the micrometer and tightened on the scale, a second clamp being used to hold the first to the micrometer. In this way the scale is held flat on the face of the anvil and at right angles to the spindle.



**Measuring Tapered Work with a Micrometer is Greatly Simplified by the Method Shown, Which Requires Nothing but a Few Tools Always Included in the Machinist's Equipment**

To measure the work for the amount of taper per inch, either end is placed upon some even inch of the scale and a reading taken, after which the piece is moved to the next inch graduation and measured again, the difference between the two readings being, of course, the amount of taper per inch. By this arrangement both hands are left free, as the clamps may be arranged to support the micrometer in a vertical position.

## Grinding Miller Index Centers

Difficulty in getting the head center of an index head to run true is overcome by using the following method of grinding in a surface grinder. Bolt the head to the auxiliary plate, which comes with the grinder. Place on the table of the grinder, swing to 30° and bolt it down. Turn the index crank and move the table in and out until the desired amount of metal is removed from the center. A center ground in this manner will be perfectly true with the spindle, something that is nearly impossible if the center is removed for grinding.—Louis M. Steffen, Dayton, Ohio.

## A Useful Pencil Marker

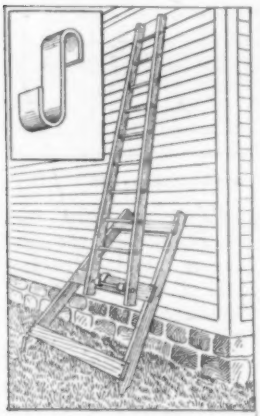
Draftsmen and others using several grades of pencils will appreciate the merits of the pencil marker illustrated, which, besides indicating the hardness of the lead at a glance also prevents the pencil from rolling. These markers are easily made in a few minutes by whittling down an ordinary thread spool, the hole in which is usually the right size to fit the pencil.

### Reproducing Building Dimensions without Plans

On many occasions it is desired to duplicate a home, store, warehouse, or other building, the plans of which are not available. If the original building is of brick, a competent brick mason can very accurately determine the dimensions from photographs showing all four sides. These photographs should have sufficient detail to permit counting the number of courses of brick, which will enable the mason to obtain the approximately correct proportions, and place doors and other openings in their correct positions. This procedure holds good for either standard-size brick, concrete blocks, or special-sized brick, but if either of the last two is used, the dimensions of the face of one of these are necessary to obtain the corresponding over-all dimensions.

### A Safe Ladder Extension

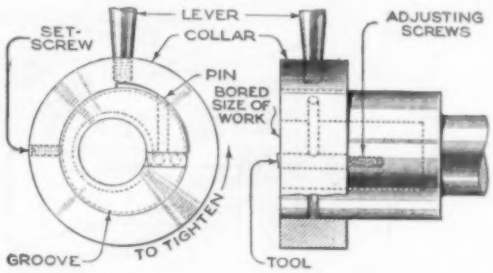
When painting or working on the side of a building, if the only ladder available is too short, an extension that will provide a solid base can be easily and quickly made from heavy lumber, as shown in the drawing. The upper end of the extension rests against the side of the building and the ladder rests on substantial flat-iron hooks fastened to one of the crosspieces of the frame.



### An Accurate Box Toolholder

The box form of toolholder has one great disadvantage when used for finishing work smoothly and accurately. The work being so well piloted in the bore of the holder, it is prevented from springing away from the tool when the latter is withdrawn after a cut, and a slight spiral groove is left in the work if the holder is withdrawn quickly; if withdrawn slowly, the tool removes a shaving of metal and reduces the diameter. For this reason, on accurate work, a slight allowance is made to be filed off later.

The box toolholder illustrated overcomes this objectionable feature by releasing the tension between tool and work when the latter has finished the cut. It is, of course, used as a finishing tool only, the work having previously been roughed down to within 1/64 in. of its finished size. The body of the holder is turned on the shank to fit the turret hole and bored at the front to the size of the finished work. The hole is bored eccentric, to permit the use of lighter stock. Next a collar is made to fit the front part of the body, drilled and tapped in one place for a lever, and at an angle of about 90° to this, for a headless setscrew. This screw bears in a groove cut in the body and serves to hold the parts together. A slot is cut in the front of the body, on the heavy side, to take the tool, and two holes are drilled and tapped in the back of the slot for adjusting screws. A hole is then drilled in the body at right angles to the slot, to take a loose tightening pin, which is filed on the top to conform to the radius of the cam surface filed inside the collar. When using the holder, push over the lever until the collar reaches the position shown in the drawing. It will be seen that the end of the tool is now backed up by the collar, while, at the same time, it is held down on the face by the pin. Before withdrawing the holder, pull the lever down until the end of the cam portion strikes the pin, which forms a convenient stop. The act of pulling back the lever relieves the pressure on the tool and also, as the tool is slightly tapered on the top so that the pin forces it back against the collar, allows it to slip back a little against the cut-away cam surface. The tool is ground on the front only, the adjusting screws at the back of the slot being used to keep it always slightly ahead of the holder.

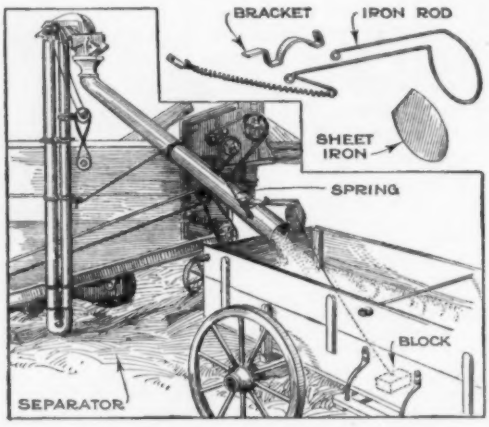



Box Toolholder for Finishing Work That does Not Cut When Withdrawn Because the Cutter is Released from Contact with the Work

¶When preheating a large casting for welding, always use a soaking heat.

### Automatic Shut-Off for Thresher Grain Spout

When operating a thresher, it is much more convenient to have a team hitched




An Automatic Shut-Off for the Spout of a Grain Separator, That Acts as Soon as the Team Begins to Pull the Wagon Away

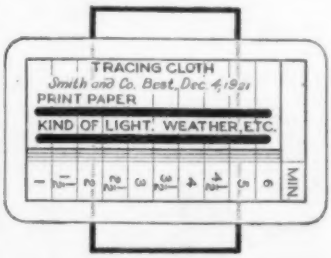
to each of the grain wagons than to unhitch the horses from the wagon being filled, but there are times when the horses will pull the wagon from under the grain spout before the attendant can reach them. To prevent the waste of grain that results from this, an automatic cut-off for the grain spout, that operates as soon as the wagon begins to move, can easily be made. A flat iron bracket is riveted to the spout; this has upturned ears, to which the iron-rod support for the shut-off is pivoted with bolts. The shut-off consists of a piece of sheet metal that closes down over the spout opening. A spring, fastened to a hook riveted on the spout, holds the shutter up until a cord, attached to the shutter, which is tied to a 3-in. square block of wood placed in the bottom of the wagon, starts the shutter to close; the spring then quickly closes it over the end of the spout. The block on the end of the spring is allowed to remain in the wagon box, and the grain covering it causes a pull when the team starts.

### A Handy Mixture for the Garage

I have found that a mixture composed of equal parts of benzol and *denatured* alcohol is very handy in the garage or repair shop; it is kept in a bottle and called "remover." This mixture removes spots from fabric without injury or stain. It will also remove paint; simply apply a little of it to the painted surface, and in a few minutes the paint will soften up so that it can be scraped off easily. It is good to remove carbon; in this case an ounce of the fluid is poured into each cylinder and allowed to stand for from 2 to 12 hours, loosening the carbon so that it will be blown out through the exhaust when the engine is started. Finally, the mixture is excellent for cleaning the hands of grease and grime.—Ralph Hanenkratt, Northville, N. Y.

### Timing Test for Blueprints

Anyone who has made blueprints knows that the print must be given just the right exposure in order to get the best results, and that the length of the exposure will vary greatly, according to the quality of the sensitized surface, and of the tracing cloth, and the intensity and actinic value of the light used. When printing by natural light, the time necessarily varies according to the hour of the day and atmospheric conditions. Therefore, when starting to make prints, it is always best to make a test to determine the proper exposure, for each condition of light, etc. The easiest and most thorough method of doing this is to use a special tracing for the purpose, marked and lettered somewhat after the manner of the one shown in the drawing.




The test print is made from the special tracing in this way: Mount it in the frame as usual, and cover with a heavy card held in the hand. At a given time by the watch, say, 9:54 a. m., for instance, expose the 6-minute strip to the light. At 9:55, move the card down to expose the next strip; in another half minute uncover the 4½-minute strip and so on. At one minute before the hour, remove the card entirely and at 10:00 o'clock take the print out and wash as usual. The resulting print will form a graphic record showing exactly what exposure will produce best results. Data can be written, if desired, on the white spaces provided for the purpose.

¶Send your radio inquiries to our Bureau of Information.

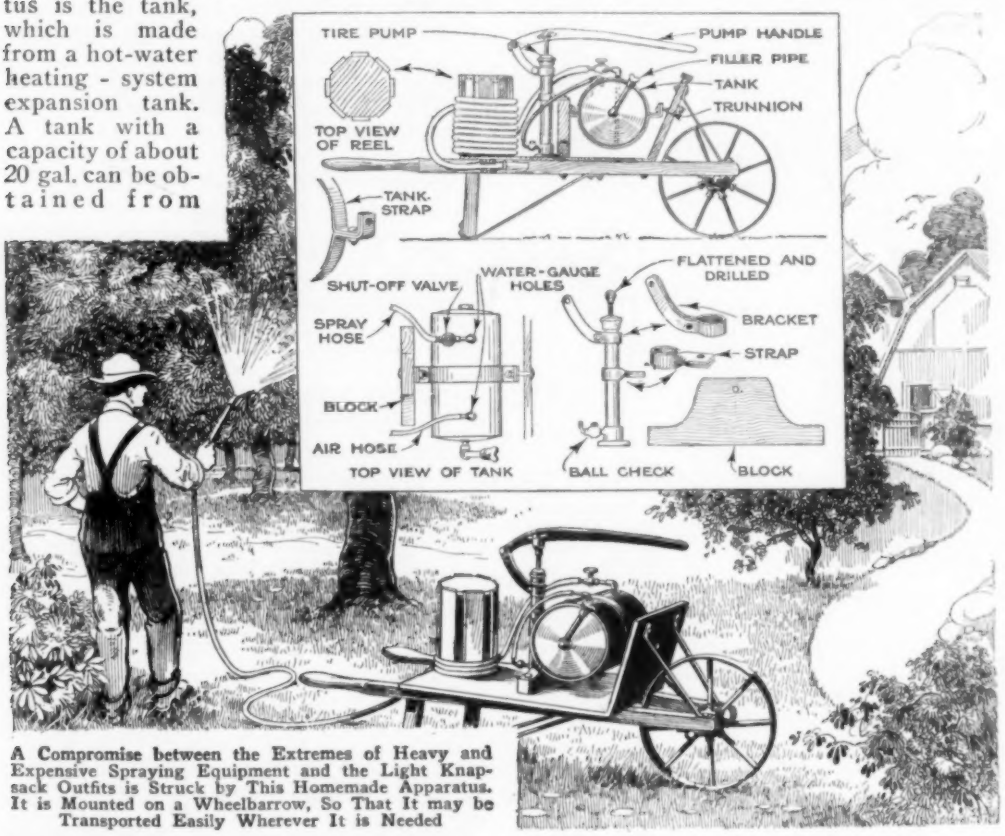
Amateur Mechanics
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

# A Wheelbarrow Spraying Outfit

By L. B. ROBBINS

A COMPACT and serviceable spraying outfit for use in the small orchard can be made for a few dollars. It is mounted on an ordinary wheelbarrow, so that it can be wheeled to any location, ready for work.

The most important part of the apparatus is the tank, which is made from a hot-water heating - system expansion tank. A tank with a capacity of about 20 gal. can be obtained from hardware dealers or plumbing contractors; it comes equipped with a water gauge and fittings, which, as they are unnecessary for the spraying outfit, are removed and discarded. After the gauge glass and fittings are removed, an elbow and two short nipples are screwed into one of the holes, for use in connecting the pump to the tank. A piece of pipe, long enough to reach almost to the bottom of the tank, is threaded for its entire length, screwed into the other gauge hole, locked with a pipe nut, under which a soft-rubber gasket and a washer are placed, and an elbow, two short nipples, and a shut-off valve are screwed on for the spray-hose connections. The pipe opening in one end of the tank is plugged, and the one in the other end fitted with a filler pipe, kept closed by an ordinary pipe cap, to which a sheet-metal wing is soldered for ease in opening and closing. A leather or rubber disk should be placed inside the




**A Compromise between the Extremes of Heavy and Expensive Spraying Equipment and the Light Knapsack Outfits is Struck by This Homemade Apparatus. It is Mounted on a Wheelbarrow, So That It may be Transported Easily Wherever It is Needed**

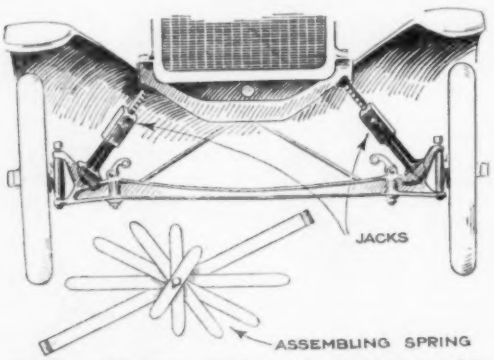
filler-pipe cap to prevent the air inside the tank from leaking.

A two-piece clamp is made of flat iron, and bolted around the middle of the tank so that the latter will balance when mounted on the trunnions, which are ordinary bolts. This arrangement makes it possible to keep the spray mixture agitated by rocking the tank, so that the ingredients do not settle to the bottom. A wooden block, bolted to the bed of the wheelbarrow, serves as a support for one of the trunnions, while the end of the barrow carries the other. An automobile-tire pump, preferably a three-stage one, is bolted to the floor of the barrow; the end of the plunger rod is either flattened or fitted with a yoke, so that it can be attached to the curved pump handle, which is made of either wood or iron. The pump handle is fastened to the cylinder by a curved bracket that clamps around the barrel just underneath the cap. A ball-check valve must be provided between the pump and tank.

A hose reel, similar to the one shown, may be fastened to the unoccupied space on the floor of the wheelbarrow, to carry the necessary hose, or the hose may be coiled inside of a box fastened to the bed. Bolts should be used to fasten all of the apparatus to the wheelbarrow, so that when the sprayer is not in use, the tank, pump, and fittings may be removed.

## Assembling and Replacing Springs

One of the frequent troubles experienced with the light automobile is breakage of the front-spring leaves. The drawing illustrates methods that facilitate the replacing or removal of a broken leaf, and the assembly of the leaves without clamping. The leaves are assembled star-fashion, as shown, about the center bolt. The nut is easily screwed on a thread or two, after which the leaves are brought into their proper position and the nut tightened.




Methods of Elevating the Front of a Light Automobile for Removing or Replacing a Front Spring, and of Assembling the Leaves without Clamping

In lifting the car frame above the axle, to remove or replace a spring, two jacks are placed, one on either side, with their bases resting against the axles, their heads resting under the lamp brackets on each side. The wheels are blocked so that they cannot rock. This affords a quick method of lifting, and one that gives a clear working space. In cases where the center bolt of the spring does not aline with the slot in the frame, by simply raising one jack and lowering the other, the body will shift enough to make them line up. The same method can be applied to lifting the rear of the car above the rear axle, although the lift will necessarily be greater on account of the considerably greater deflection of the rear spring.—G. A. Luers, Washington, D. C.

## Mower Attachment for Cutting High Grass

After the lawn has been neglected and allowed to grow for more than a week, it is generally hard work to make a good job of mowing, as great exertion is required to push the mower into the tall growth.

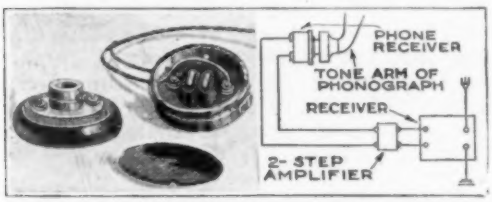
The photograph indicates a way out of the difficulty. It consists in attaching to the mower a revolving blade, or fan, which pushes the tall grass into the cutter so that it can be cut off instead of being pushed over by the advancing lawn mower and rolled flat on the ground. Two pieces of flat-iron stock are drilled at one end to take a light shaft, and the opposite ends are drilled to fit under nuts on the mower-wheel housing. A piece of stiff sheet metal, or light board, is mounted on the shaft between the bearings, one outer end of the shaft being provided with a small pulley in line with the mower wheel. A belt around the

An Attachment for the Lawn Mower Which Makes It Possible to Mow Grass of Tall Growth Easily

wheel of the mower and the pulley causes the fan to revolve when the implement is pushed forward, the grass being pushed into the path of the revolving cutters.—Maurice Staller, Fowler, Ind.

## Radio Sound Amplifier Made from the Phonograph

Every night thousands of radio enthusiasts are receiving the musical programs that are broadcast at certain hours. When dependent on ordinary phone receivers the size of the audience is limited to the number of headsets available. However, without spending much money, an ordinary phonograph can be used to amplify the sounds so that all within hearing can enjoy the program. An old phonograph reproducer, or sound box, of a type suited to the phonograph used, is procured, and its back is cut off and fastened to the cap of a telephone receiver, using a piece of felt between the metal and cap. It can then be slipped onto the tone arm of the instrument in place of the regular reproducer. This arrangement in no way interferes with the use of the phonograph for its regular purpose, as it is only necessary to remove the telephone receiver and replace the reproducer, which, in most types of instruments, is simply a matter of a twist of the wrist.—Edward Thomas Jones, New Orleans, La.




The Back of an Old Phonograph Reproducer Fastened to the Cap of a Telephone Receiver, and Slipped onto the Tone Arm of a Phonograph, Makes an Excellent Amplifier for Entertaining an Audience

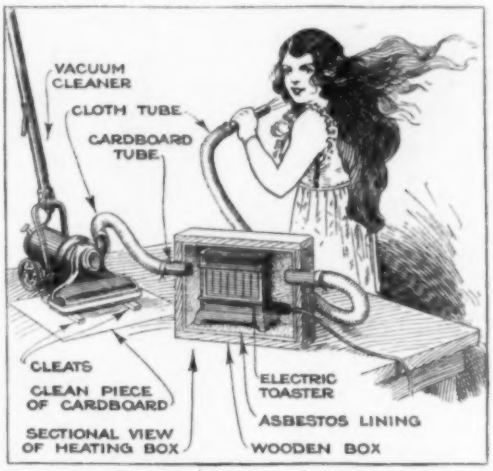
## Clothespins Replace Rake Teeth

About half of the original wooden teeth of a lawn rake were broken, and as a result the rake was practically useless for any purpose until the missing teeth were replaced.

Clothespins were used for the purpose, and in order that all the teeth would be uniform, the old teeth were first removed. The clothespins were fitted for their new duty by dressing the heads down to fit the holes in the bar.—Gregor H. Glitzke, Kansas City, Mo.

## Hair Drier Made from Electric Toaster and Vacuum Cleaner

A simple but effective apparatus for drying the hair with a blast of warm air, or for other purposes where a supply of heated air may be required, is easily made from an electric toaster and a vacuum cleaner. A wooden box, large enough to contain the toaster, is lined with sheet asbestos, sodium silicate (water glass) being used to paste the asbestos paper to the wood. Openings are cut through opposite ends of the box and metal tubes inserted, over which the air tubes are fastened with light twine. The short air tube, or hose, can be made by sewing together the edges of a strip of closely woven cloth to form a pipe; the longer one is usually supplied with the cleaner. Another piece of tubing, which may be cardboard, is used at the outlet end.



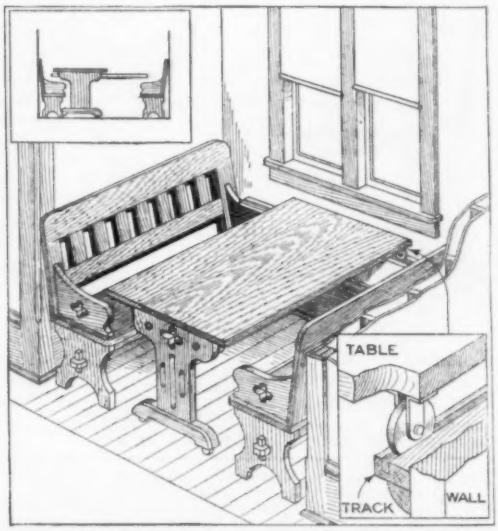

Drying the Hair by Means of Heated Air Furnished by an Electric Toaster and an Electrically Operated Vacuum Cleaner

The vacuum cleaner is placed on a sheet of clean cardboard, the nozzle elevated on one or two strips of wood, and the dust bag is removed, so that one end of the short tube can be slipped over the dust-bag nozzle and fastened. The toaster is placed inside the box, the box closed, and the current turned on; when the toaster is well heated, the vacuum-cleaner motor is started. The air entering through the vacuum cleaner is carried through the heated chamber and is delivered through the outlet tube on the opposite side.—H. A. Strickler, Buffalo, N. Y.

¶Our Bureau of Information will answer all inquiries on radio-instrument construction and operation.

### Improved Breakfast-Nook Table

A serious objection to built-in dining or breakfast alcoves is that it is generally necessary for the diners to slide or




Supporting One End of the Breakfast-Nook Table on Wheels, That Travel in a Track Fastened to the Wall, Makes It Easy for the Users to Seat Themselves

squeeze into the limited space between the table and the benches. This objection, in one instance, was successfully overcome in the manner shown in the drawing. The end of the table next the wall was supported on small wheels, running on a grooved track attached to the wall. Set up in this manner, the table is pushed to one side until the occupants of one of the seats are in place, when the table is pulled back so that others can be seated on the opposite bench. A table made in this manner will require only one pedestal, which, of course, is fitted with casters.—J. H. Kay, Cleveland, Ohio.

### Dark Box for Photographers

The amateur photographer frequently finds it necessary to leave the dark room during the process of developing a film or plate, and is then compelled to improvise some sort of light-proof covering for his trays to prevent spoiling of the work. After frequent experiences of this kind, one amateur made a simple cover box, which also serves as a receptacle for storing his apparatus when not in use. A heavy cardboard box, large enough to cover the three trays, was used, a 2-in. strip of red cloth being glued around the edge to form a curtain, and a strap handle attached to the top for convenient lifting. When it is necessary to open the door of the dark room, the box is placed over the trays, any irregularities on the top of the table or edge of the box being taken care of by the red-cloth curtain, which filters any chance rays of light.

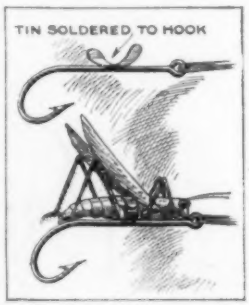
### Replacing Worn Spring Bushings

It is sometimes difficult for the amateur mechanic to change the bushings in automobile springs, owing to the fact that the bushing are thin on one side, if not completely worn through. It is also found that the new bushings contract when forced in, making it necessary to ream them out before the shackle bolt will fit.

An easy way to replace the worn bushing with a new one is to remove the old shackle bolt, slip the new bushing over it, and then drive the bolt back into its proper place in the spring eye. This forces the old bushing out and at the same time prevents the new bushing from contracting or from having its end battered. This will probably spoil the old bolt, but that is generally of little consequence. Even when a new bolt must be used, the time and labor saved would be worth the cost. A heavy hammer, or block of wood, should be held against the opposite side of the spring while driving in the bushing. If a heavy arbor press is available, this, of course, should be used to press the bushing into place.—Philip Jonker, Peekskill, N. Y.

### Novel Attachment for Fishhook

When fishing with flies or grasshoppers for bait, I tried out the idea of fastening the insect to the shank of the hook with a strip of adhesive plaster. This plan worked well, but, owing to the moisture, the tape soon loosened, and the improvement shown in the drawing was then made. A small strip of thin sheet metal was soldered to the shank of the hook in such a manner that, by bending the ends around the body of the insect, the latter was held in a lifelike position, floating on the surface of the water, with the barb of the hook underneath.—G. E. Hendrickson, Argyle, Wis.

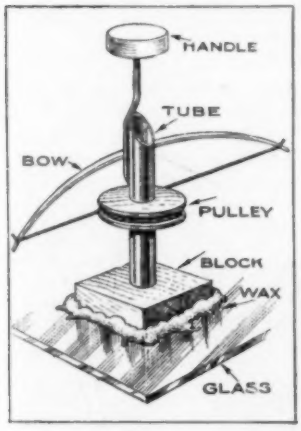


### Spigot for the Oilcan

Many automobile owners buy their oil in 5-gal. cans, and to pour the contents is inconvenient and generally wasteful, due to the weight of the can when full and to the fact that the oil comes out in spurts. A spigot soldered to the *top* of the can will provide a convenient and wasteless method of pouring. As the screw caps on these cans are very nearly uniform in size, the spigot can be soldered to one of the caps.—R. H. Kasper, Philadelphia, Pa.

### Drilling Large Holes in Glass

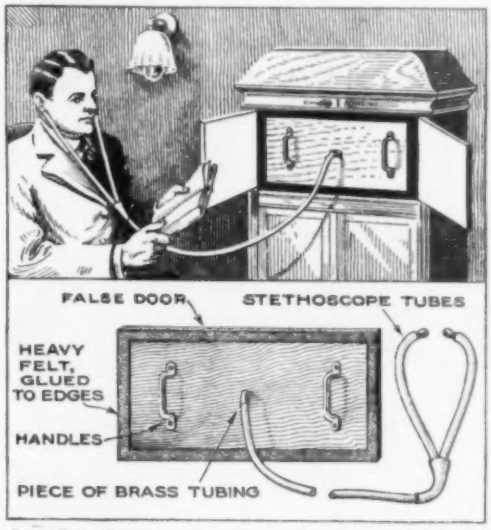
To drill comparatively large holes in glass, without the danger of breaking it, the arrangement illustrated may be used, and will produce a clean, smooth hole. A piece of thin brass or copper tubing, the outside diameter of which is the same as that of the hole to be drilled, is fitted with a wire handle and a small wooden pulley. A wood block with a hole in the center to fit the tubing used, is provided, and is fastened to the glass by running melted beeswax around the edges. The tube is placed in the hole in the block, partly filled with a mixture of emery and water, and rotated by means of a bow, in the manner of a fiddle-bow drill, the string passing around the pulley. This method is particularly suitable for drilling holes in curved glass, as the underside of the block can be shaped to the curvature of the surface, so that the drill will not slip.




### Language Study on the Phonograph

The student of foreign languages by the phonograph method usually makes a nuisance of himself to other members of the family when the instrument grinds out the grammatical construction, and other information concerning the language.

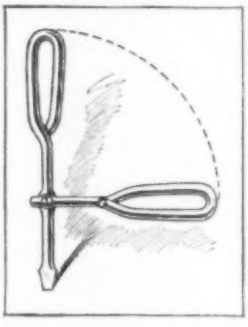
The drawing shows how one student kept the lessons all to himself by closing the front of the phonograph cabinet and carrying the sound to his ears by means of part of a stethoscope and a rubber tube. The board is edged with felt and fits tightly into the opening when the sound-chamber doors are opened. A piece of brass tubing, screwed into the center of the board, is used as a connection for the stethoscope ear tubes. The board is fitted with handles, so that it is easily put into place or removed.




**Studying Foreign Languages by the Phonograph Method, a Student Uses the Device Illustrated to Prevent Disturbing the Other Members of the Household**

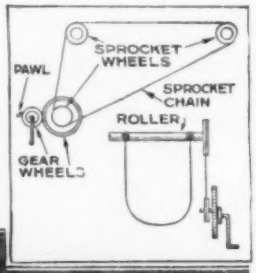
### Screwdriver Has Extra Leverage

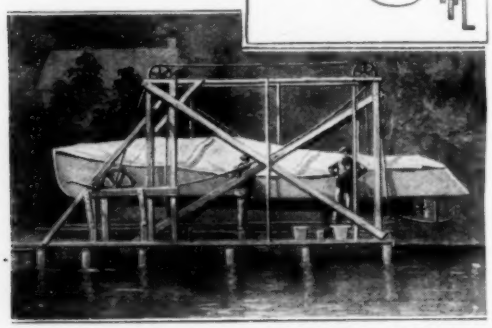
A screwdriver, provided with an extra handle to be used as a lever when an obstinate screw is encountered, may be made of 5/16-in. rod. The two handles are formed alike, and the screwdriver bit is forged on the end of one. Both are then flattened slightly at the center, the end of the extra handle cut off, and the handles drilled and connected by a small screw or rivet. Normally, the two handles are parallel, but for driving screws into hardwood, or starting a tight screw, the short handle is brought down as shown and used as a lever.



## A Simple Boat Hoist

A very efficient and inexpensive apparatus for moving motorboats and similar craft out of the water for winter storage or repairs is illustrated in the photograph. Four 4 by 4-in. uprights, securely braced by 2 by 4-in. material, are erected at a point where the depth of water



**Motorboats and Similar Craft are Easily Lifted from the Water for Storage or Repairs by Means of a Simple and Inexpensive Hoisting Device**

is sufficient to float the boat to be lifted. The uprights support 4 by 4-in. crosspieces. The distance between the uprights, as well as their height, will, of course, depend entirely upon the beam of the craft and the elevation to which it is to be hoisted.

The lifting mechanism is quite simple, and consists of three sprocket wheels of the same diameter, operated by an endless chain, to which power is applied by means of a crank, driving a gear and pinion. The gear and one of the sprockets are mounted together on the same shaft, while a pawl, or "click," is provided to engage with the teeth of the pinion to hold the boat at any desired height. Extending from one side to the other of the framework are two rollers, about 3 in. in diameter, with a sprocket wheel rigidly secured to each. Bearings for the rollers are fastened to horizontal crosspieces. Chain slings, with ropes attached to the ends, are passed around the boat hull at stem and stern, the hull being protected from injury by covering the chains with old rubber hose.

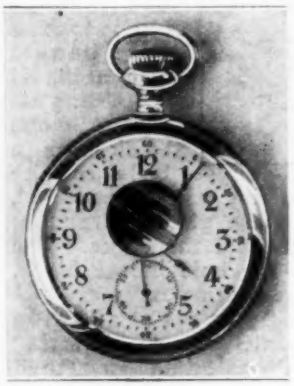
By reference to the diagram it will be apparent that this arrangement provides a very powerful hoisting apparatus, requiring but a small amount of power.—C. L. Meller, Fargo, N. D.

## Writing on Glass

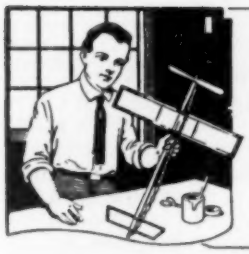
Names and designs can be etched on glass without the wax ground or hydrofluoric acid generally required, by a simple method, which makes it possible to write directly on the glass with a rubber point or even a quill pen. Two solutions are mixed in separate bottles, and equal parts of each are mixed as required. The first consists of 35 gr. of sodium fluoride and 7 gr. potassium sulphate in 1 oz. of distilled water; the second solution is made by mixing 15 gr. of zinc chloride, 65 drops of hydrochloric acid, and 1 oz. of distilled water. Only enough should be mixed for immediate use, and the glass must be perfectly clean and dry.

## A Watch-Crystal Mirror

There is a little unused space on most watch crystals that can be utilized to make a small mirror. Cut a piece of pure tinfoil, not too thin, to the size and shape desired, and clean the surface of the foil and the glass with ammonia. Amalgamate the clean surface of the foil by rubbing a drop of mercury over it with the finger. This done, take the foil in a pair of tweezers, and dip it into some clean




mercury so that some of the latter will adhere to the surface. The piece is then placed on the glass with the amalgamated side next to the crystal. Care must be taken to eliminate all air bubbles between the tinfoil and glass, and this is best done by putting the piece of foil to one side of its final location, and sliding it into place with the finger. The amalgamated tinfoil must be kept under pressure against the glass for about 18 hours; this is best done by clamping foil and crystal between felt pads. Care must be used to prevent any of the mercury from coming into contact with the watch-case or movement. Most watch crystals being curved, such a mirror will be convex and will reflect a reduced image of practically the whole head, making it useful for combing the hair or adjusting a tie.—Walter E. Burton, Kenmore, Ohio.

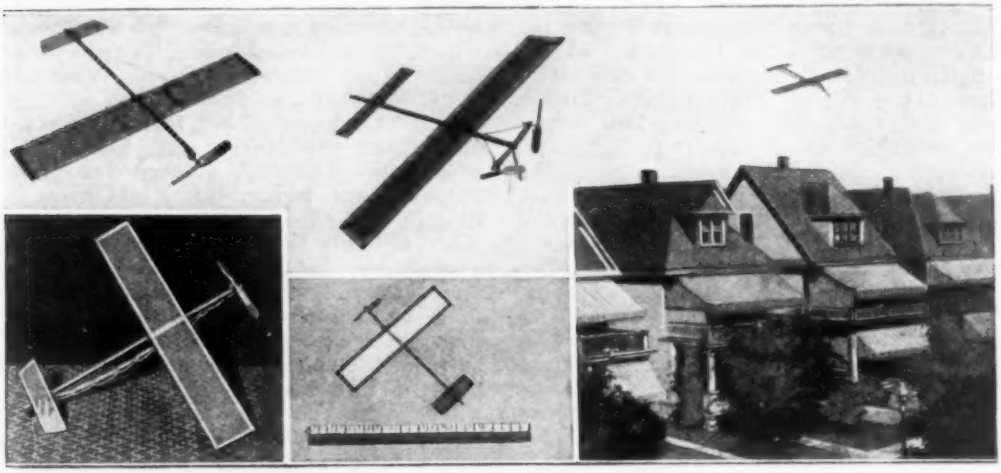


# HOW TO BUILD MODEL AIRPLANES

By DONALD W. CLARK

THE model airplanes illustrated, while they do not exemplify the very best performance or design, nevertheless have proved to be very satisfactory in flight, and have structural features that make them easy to build. Because of this simplicity of design, they will appeal to the person who likes to build, whether he has had experience in this line or not, and there is little doubt of his ability to complete the style of his choice, provided he has the necessary patience and consideration for detail.

Since the "racer," Fig. 1, the "fly-about," Fig. 2, and the "rise-off-ground," Fig. 9, types are nearly alike, they will be described first. The wings of all three are built up in the same manner, using materials of the same kind, but differing in their dimensions. To build the wings for either model, two strips of white pine, basswood, or spruce are selected, a trifle over the required length, planed down to measure exactly ⅛ by ¼ in., and then cut to length. Mark the middle of the strips, and drill a 1/16-in. hole through each. In the center of each end of the strips drill a 1/16-in. hole ½ in. deep. Next, cut several strips of tough paper 1 in. wide, coat them with glue, and bind each end and the middle of the spars, wrapping two or three thicknesses of paper around them; this is to prevent splitting. From a piece of soft wire, 1/16 in. in diameter, cut a piece 1 in. longer than the distance between the centers of the spars, and bend right angles ½ in. from each end. Flatten the ends of the wires on an anvil or vise, lay the spars flat on a smooth surface, and insert the short ends of the wires into the holes in the ends of the strips, forcing them in as far as they will go, as indicated in Fig. 5. When these wires are bent to control the direction of flight, they will stay so, because they are soft and because the flattened ends prevent them from moving up and down. This method bends the rear spar a little, but it has proved satisfactory on many models. After the wing frame has been assembled, lay it on a piece of tough paper, mark the outline, and then cut it out, leaving a ½-in. margin on all sides. Now coat the underside of the frame with glue, place it on the paper, having the margin even all around, and work out the wrinkles, being careful not to bow in the spars. Cut the ends of the paper to fit between the spars, coat them with glue, fold over the wires, and stick to the



Above, Left: The "Fly-About" Model Shown with Two Extra Wing Ribs; Center: The "Twin-Pusher" Type with a Cruising Radius of from 600 to 800 Feet. Below, Left: This View of the Fly-About Model Shows How the Motor is Assembled; Center: A Tiny Model Compared with a 12-Inch Rule; It is Driven by a Two-Inch Propeller. Right: One of the Model Planes in Flight

top side of the paper. After the glue has dried thoroughly, lay the wing on a smooth board and trim off the surplus paper. Punch a hole through the paper binding over the holes in the spars, and give the whole a coat of waterproof varnish to make an exceedingly tough and durable unit.

For the motor bar, cut a piece of pine or spruce, ¼ by ⅜ by 24½ in. Lay it flat, drill a 1/16-in. hole about ¾ in. from one end, and another ½ in. from the first. Bend a piece of soft wire as in Fig. 3, slip it through the holes, and bend the ends as shown. The propeller bearing on the racer is made from a piece of sheet metal, drilled for the 1/16-in. diameter shaft, and fastened to the bar as shown in Fig. 6, although it can be bound to the shaft with glued paper; the latter will, perhaps, be the better way for the beginner. Figure 7 shows how to make the propeller. The shaft should be made of wire, bent as shown in Fig. 1, and slipped through the hole drilled in the center of the propeller; by indenting the hub a little with the short end of the shaft, the exact position for the extra hole can be found. When this is drilled, slip the shaft through the hub again, pressing the short end into the extra hole; this prevents any chance of the propeller turning on its shaft. Another way is to flatten the end of the shaft and force the widened part into the wood, parallel with the grain.

The elevator, Fig. 4, is made of pine or basswood, bound in the middle with glued paper, as described for the wing spars and indicated by the shaded section in Fig. 1. Plane down the wood to 1/16 in. in thickness, and cut a piece of the proper size; for the racer, it should measure 2½ by 8 in., for the fly-about 2½ by 8½ in., and for the rise-off-ground model 3 by 9 in. Bind the edges with a strip of paper and varnish. The elevator of the racer is not movable, but is attached with two round-head screws to the motor bar. This makes it impossible to alter the angle of the elevator on this model without removing it from the bar. Two or three small washers underneath the forward edge serve to place it at the correct angle. On the fly-about and rise-off-ground models, however, the elevator is adjustable, and is fastened with but one screw near the rear edge, which serves as a pivot, and one rubber band; the latter holds the elevator down against a flat-headed screw located under the front edge, and also keeps it straight. To increase or decrease the angle of the elevator, merely turn it to one side, so that the hole shown in the drawing will come over the screw head. Then, with a small screwdriver, turn the screw in or out as needed, and allow the elevator to return to its normal position. The rubber band also prevents breaking of the elevator by absorbing some of the landing shock.

The rise-off-ground model, Fig. 9, is just like the fly-about, except that it has a little more surface than the latter, and the wing is set at an angle large enough to give it a good lift. This is done with small washers, or coiled wire of sufficient thickness to raise the front wing spar about ⅛ in. The drawing shows how the landing gear, which consists of three wheels mounted on hard wire, is attached. Make the wheels of cigar-box wood, drill the centers, and use the same size of wire for the axles as for the wire supports, the ends of which should be looped around the axles. The small front wheel must be a little lower than the others, so that the forward end of the motor bar will be higher than the rear when the model is resting on the ground. The diameter of the front wheel is 1½ in., and the larger ones are 2 in. in diameter.

The "twin pusher," Fig. 10, is more elaborate than the other three, but is not beyond the amateur's ability. Its elevator does not swing, but it is made in exactly the same manner as the other models. This is also true of the wing, except that in this case the spars are ⅜ in. square in the middle, tapered down to ⅛ by ⅜ in. at their tips. Two extra wire ribs are placed 6 in. from the center, between the spars. The holes are drilled and the ribs inserted before the paper wing covering is applied. The motor bar is of pine or spruce, ½ by 1 by 43 in., shaped as shown in the drawing. Make the front hook from a 4-in. length of wire, insert it in a small hole drilled near the front of the bar, and bend the loops. The crossbar that takes the bearings should be of ash or other hardwood, and be braced with 1/16-in. hard wire. The bearings are strips of sheet metal bent to U-shape and riveted to the crossbar, and hard wire is used for the landing skids. The front edge of the wing should be raised about 1/16 in. The elevator is adjustable, and is attached to the motor bar by two screws; the front one runs through a small coil spring between the spar and motor bar, and furnishes a means of changing the angle of the elevator.

The power on all these models is furnished by rubber bands, about 3/64 in.

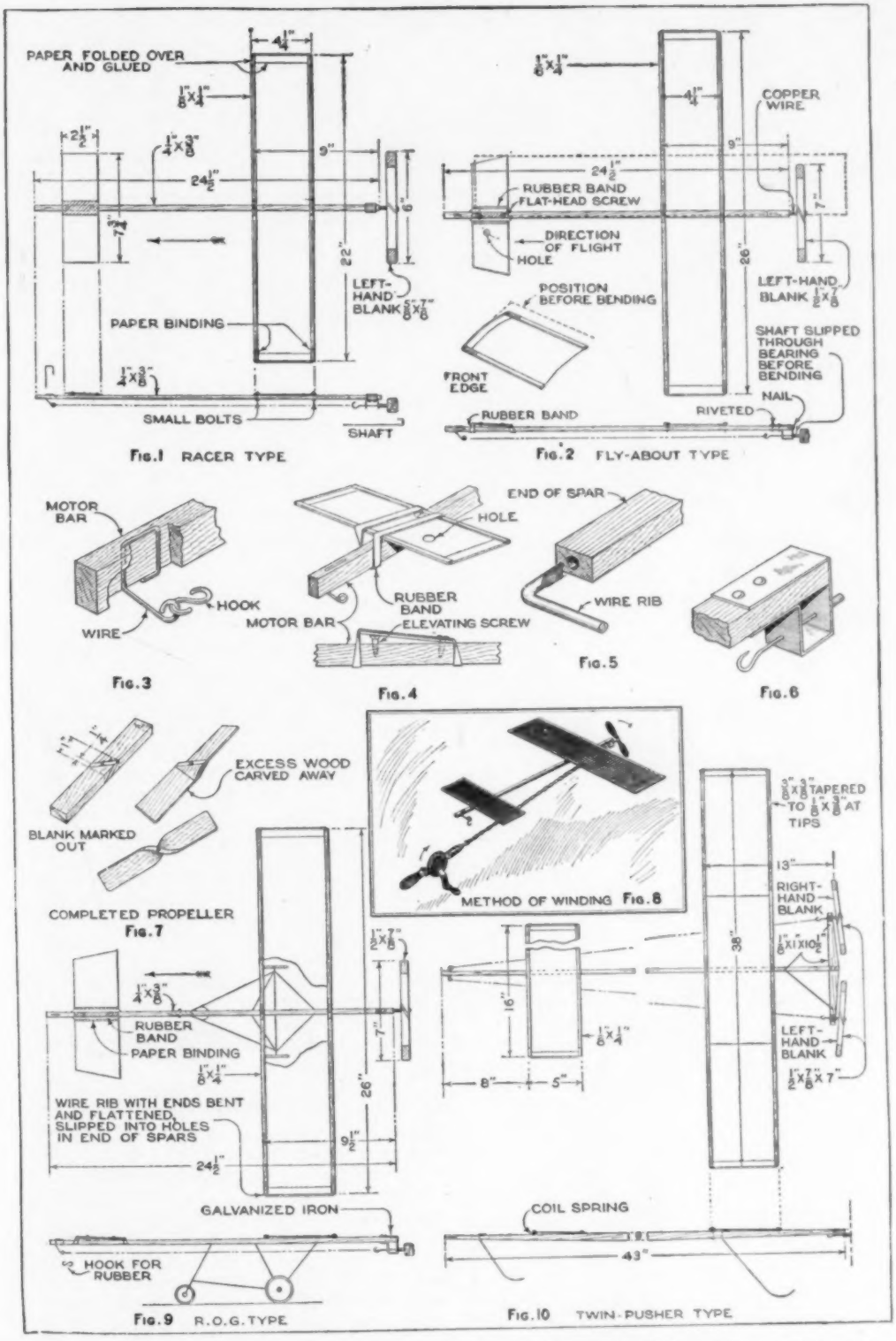



Fig. 1 RACER TYPE

Fig. 2 FLY-ABOUT TYPE

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9 R.O.G. TYPE

Fig. 10 TWIN-PUSHER TYPE

The Four Styles of Model Airplanes Illustrated have Proved Satisfactory in Flight, and Possess Features That Make Them Easy to Build. The Line of Flight and Altitude of the Models are Regulated by Adjusting the Wings and Elevators. The Driving Power is Furnished by Rubber Bands

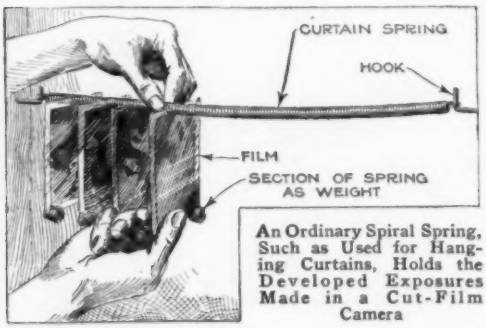
thick, 3/16 in. wide, and 4 in. long, linked together chain fashion, so that three of the bands will only make a length of 6 in. instead of 12 in. This method allows broken bands to be replaced with new ones quickly and easily.

A wire hook, inserted in the chuck of a hand drill, as shown in Fig. 8, will serve as a winder. After linking the bands together on the model, release the front end of the "motor," and hook it to the drill. Stretch the rubber to about twice its length and turn until about half wound. Then keep turning, but gradually release the tension so that the rubber will be straight when fully wound, and hook on again. The number of turns needed will be found through experience; the twin model will stand more than 1,000 turns to each propeller, which means that with a gear ratio of 4 to 1 on the drill, the handle will have to be turned 250 times. The two propellers on this model must revolve in opposite directions.

To launch, hold the motor bar with the right hand, just ahead of the wing, and the propeller with the left. Then, with a quick, upward push, send the airplane into the air. If it has a tendency to climb too steeply, the elevator should be lowered a little, and if it loses altitude, the elevator should be raised enough to correct this fault. With both wing tips flat, the planes will have a tendency to turn to the right. Curving the right-wing tip down a little will give a straightaway flight; a left turn can be made by curving the right tip down still more. Several trial flights will probably be necessary before the proper adjustment is obtained.

### Simple Hanger for Cut Films

An ordinary coil spring, such as used for holding window curtains, can be made into a holder for developed exposures




An Ordinary Spiral Spring, Such as Used for Hanging Curtains, Holds the Developed Exposures Made in a Cut-Film Camera

from a film pack. The spring is suspended between two hooks, as shown. The films are inserted between the coils, the compression of the spring preventing them from slipping out. To prevent the cut films from curling, ½-in. sections of a larger and heavier spring may be slipped over the bottom to serve as weights.—W. W. Baumeister, Cambridge, Mass.

### Registers Used as Ventilators

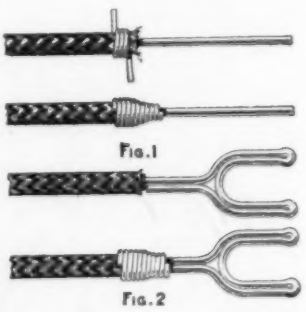
Adjustable steel hot-air registers can be used as a means of ventilating the garrets of houses having poor ventilation under the roof. They are very easily put up and are neat in appearance. An opening is cut in the gable end of the house and the register plates fitted and screwed to the siding.—Louis M. Steffen, Dayton, Ohio.

### Testing for Leaky Tire Valves

Automobile tires, suspected of having a slow leak at the valve, can be tested without removing the tire from the rim. A convenient method for detecting such leaks consists in filling a small bottle with water and immersing the valve stem in it. The wheel having the suspected valve is turned so that the valve is at the top, and the valve stem is inserted into the neck of the bottle. Leaks will manifest themselves by a series of bubbles.

### Neat Tips on Wires

In order to have the wiring look neat on a radio set, or other instrument being made, all wires with visible connection to binding posts should be wound with small bare wire to prevent the insulation from raveling out. Fig. 1 shows the insulation removed from the wire, the winding of the tip started



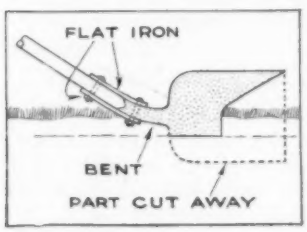

with a piece of bare wire of small diameter, and the neat finished effect. Fig. 2 illustrates the method of making a tip for connecting to another style of binding post. The latter is a connection that is especially useful when the wire is to be frequently connected to or disconnected from a binding post.

### Stencil-Color Pails for Painters

When using different colors of paint in ceiling work, such as in stenciling and painting designs, I have found it quite a help to use several cans containing the separate colors and fasten them onto a cord or belt. Holes or slots are cut near the top of quart cans through which the cord or belt is inserted. About an inch of color is placed in the cans. In use, the belt or cord to which the cans are attached is worn around the painter's waist. This arrangement does away with the constant bending and stooping to the floor or scaffold.—C. O. Soots, North Salem, Ind.

### Lawn Edger Made from Shovel

One way to make a lawn trimmer or edger is to use the remains of an old shovel or spade in the manner suggested by the drawing. From the front corner of the shovel blade draw a straight line diagonally toward the shank. When about two-thirds of the distance from the edge to the shank, turn the line downward, and, when an inch or two below the shank, turn again at right angles, as shown. Then cut along this line with a cold chisel and smooth the rough edge on a grinding wheel, sharpening it at the same time; a file will answer the same purpose. Finally, heat the shank a cherry red, bend upward, and insert a long handle, reinforcing it with two pieces of flat iron on the top and bottom. The edger is pushed along in the position shown.

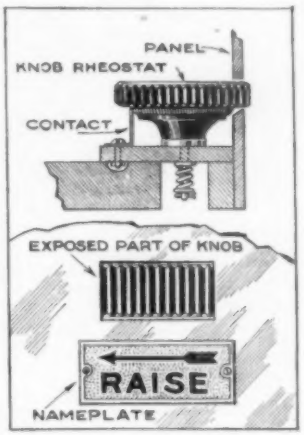



### Lining a Hanging Basket

If even a little of the moss lining of a hanging basket falls away, a hole will soon form that will permit the earth to wash out when the plants are watered. This trouble should be prevented when the basket is made up. After the moss lining has been put in place, a circular piece of burlap, or similar material, is laid inside against the moss, before the basket is filled with earth. The burlap lining holds the earth, even should the moss become loose or punctured.

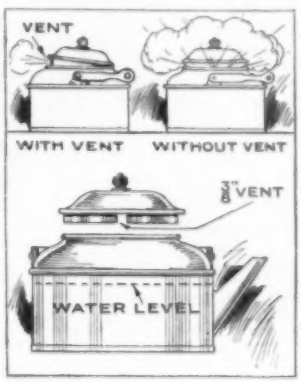
### Novel Radio-Rheostat Mounting

When making a radio set that was intended to be as compact as possible, it was discovered that it was out of the question to mount the panel-type rheostat in the usual manner. The difficulty was overcome by using a rheostat in which the resistance wire is molded into the knob and mounting it horizontally instead of vertically. A slot was cut in the panel, through which the rheostat knob projected about 1/16 in. Thus the knob could easily be revolved with the thumb or forefinger to any desired adjustment.—Leon D. Quick, Milesburg, Pa.




### Safety Vent for the Teakettle

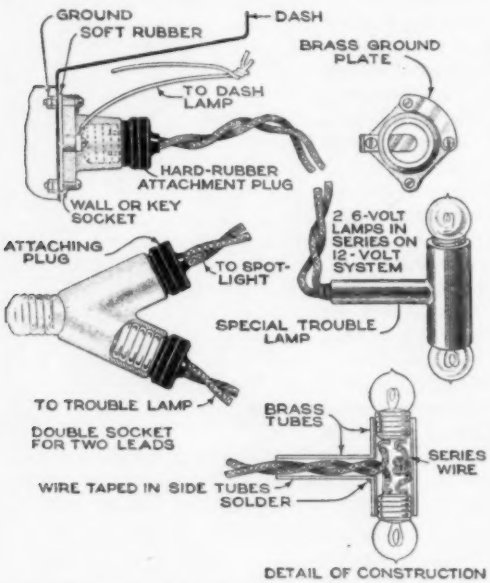
When the teakettle is filled with water above the inner opening of the spout, the cover will vibrate when the water begins to boil, making considerable noise, besides which one may easily scald his hands by the escaping steam. This undesirable feature can be overcome by cutting a slot, about 3/8 in. wide, in the flange of the cover. The steam pressure will raise the cover slightly, and allow the vapor to escape through the vent in a horizontal stream. By turning the cover so that the vent is opposite the handle, all danger of being scalded when picking up the teakettle will be eliminated.




¶Old newspapers soaked in water, twisted tightly, and dried, make good kindling.

### Trouble Lamp Installed under Dash

Many automobiles have no provision for plugging in a trouble lamp or spotlight except by removing the dashlight




**Arranging an Ordinary 110-Volt Lamp Socket on the Automobile Dash So That It will Not Be Necessary to Interfere with the Dashlight When a Spotlight or Trouble Lamp is Used**

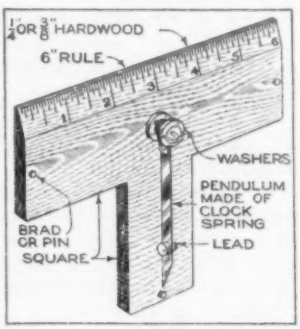
bulb and attaching the cord there. The owner himself can easily overcome this lack by installing a standard-size 110-volt porcelain socket, of either the plain or key type, under the dash, where it will be out of sight and protected from accidental injury, yet accessible. The large socket is preferable, as it is more substantial and permits the use of standard attachment plugs or two-way sockets. Only two small holes are necessary through the dash for No. 8-32 machine screws and nuts, with a locknut on each, for bolting the socket to the sheet metal. If the one-wire system is used, one side of the circuit being formed by the metal parts of the car, a curved brass plate is run from one socket terminal to one of the bolts for the ground terminal. The other terminal is preferably soldered to the lead running from the dash lamp, unless some other connection is more convenient. A sheet of soft rubber or packing should be placed between the socket and dash.

A porcelain attachment plug and cap can be used, though the hard-rubber variety is a little smaller and less breakable; ordinary lamp cord may be used for the lead. The drawing shows the construction of a homemade trouble lamp, the object of which was to use some old 6-volt bulbs on a 12-volt system; 3½-volt flashlight bulbs could be used in the same manner on a 6-volt battery. A large and small brass tube are soldered together at right angles, the run of the "T" thus formed being lined with several layers of shellacked or insulating paper, to leave an opening just large enough for the lamp bases to slip into. The lamp cord is threaded through the small tube and brought out at each end of the larger, and each wire is soldered to one terminal of the lamp bases. The other two terminals are connected by a short piece of insulated wire, thus connecting both lamps in series. By drawing back the lamp cord, both bulbs are drawn into the tube, and tape is wrapped around the lamp cord and tube to hold all in place.

By using a two-way socket, screwed into the main socket, a spotlight or other accessory can be plugged in at the same time as the trouble lamp.

### Useful Tool for Home Mechanics

Combining a square, plumb, and rule, the tool illustrated is well worth the slight time and trouble required in making it. Wood is used for the T-shaped piece, the long edge of which is graduated in inches and fractions, while the angles formed at the corners are used as squares. The plumb consists of a weighted pendulum, made from a piece of clock spring. Brads, or pins, are inserted at the proper points on the three ends of the device to indicate the true plumb line, when using the tool to test the level of a surface.




### Novel Use for the Phonograph

A phonograph may be used to advantage for winding thread, yarn, or cord on a spool quickly and without trouble. A small piece of paper is placed over the turntable spindle, and a spool slipped down over it. The paper prevents the spool from slipping on the spindle. Upon starting the motor the spool will revolve

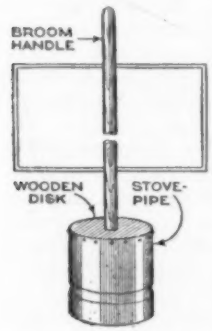
with the turntable so that it is only necessary to guide the material being wound onto it. On most makes of phonographs the turntable can be lifted off, should it be found that it interferes with the winding, but in so doing the motor runs free because the brake that controls the starting and stopping of the machine operates on the edge of the turntable.—Robt. U. Matthews, Mist, Ore.

### Clothes Cleaned by Vacuum Cleaner

By using the vacuum-cleaner attachment intended for cleaning the upholstery of furniture, clothing can be cleaned with a minimum of trouble. The garments are laid out flat on a table and gone over several times; the results are much more satisfactory than brushing.—Alvin S. Hinnershitz, Reading, Pa.

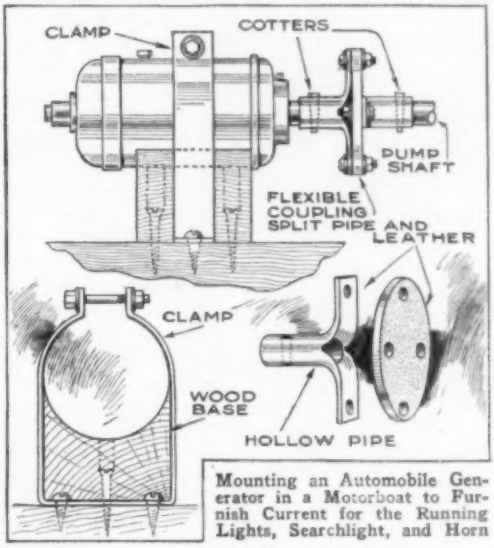
### Cutter for Strawberry Runners

Strawberry plants send out runners, that, unless kept cut off, permit the plants to spread to such an extent that they cannot easily be cultivated. This and other reasons make it necessary to keep the runners cut short, and the drawing shows a tool that eliminates this back-breaking labor of the strawberry grower. As shown in the sketch, a thick wooden disk is attached to the end of a wooden handle. A piece of stovepipe is nailed to the disk and forms the cutter, the edge of which may be filed to make it sharper. In use, the cutter is merely placed over the plant and pressure applied to the handle, severing any runners longer than the radius of the hollow cylindrical cutter.—Luther Holton, Rushville, N. Y.




### Attaching Generator to Boat Engine

A storage battery is a most desirable addition to any boat, because of the advantage in using electric running lights, providing current for a powerful searchlight, and for the signal horn. However, the battery alone is more or less of a nuisance, as it must be frequently removed and recharged, if there is no generator. To avoid this, a charging generator, such as can be picked up at any automobile-wrecking establishment, can be readily attached to almost any make of marine motor. In the case illustrated

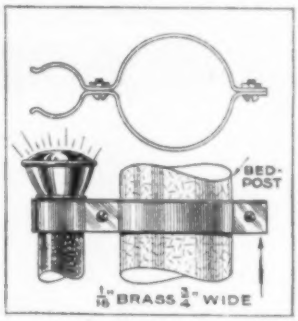



Mounting an Automobile Generator in a Motorboat to Furnish Current for the Running Lights, Searchlight, and Horn

the generator was cylindrical in form, with the cut-out at one end. The pump shaft having been decided upon to drive the generator, the flexible coupling shown in the drawing was made. Pieces of steel tubing were split for a part of their length, and the split ends opened out and flattened. The flattened ends were bolted, at right angles to each other, to a leather disk, and the tubular ends were attached to the generator and pump shafts by cotters. The generator itself was held to a wooden block or saddle by means of a simple clamp.

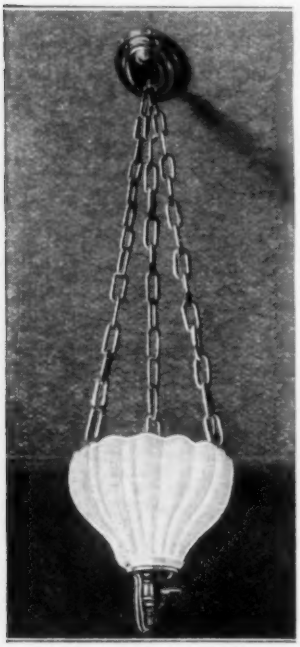
### Flashlight Bracket for the Bed

To make the electric flashlight available at any time during the night, a simple bracket can be made and fastened to the bedstead. A piece of No. 16 gauge sheet steel or brass is used. Two strips about ¾ in. wide, are needed, and these are bent to fit around the bedpost and flashlight, as shown. After forming the strips, holes are drilled to take two small bolts for clamping it to the bed.



### A Cheap Indirect Lighting Fixture

I needed a strong light for some special work, but quickly discovered that the direct glare of the unprotected 200-watt nitrogen-filled lamp used defeated its own object by causing eyestrain, making it absolutely necessary to diffuse the light. Three lengths of brass chain, an eyelet, and a ceiling plate were bought from a 10-cent store, and the regular reflector or shade carrying the lamp was inverted and suspended in the manner shown. The chains are attached by means of small clamps.—Glen McWilliams, Detroit, Mich.



### Protecting Grass Seed on Terraces

A newly seeded terrace can be protected effectively against washing if strips of burlap are laid over it, as indicated in the illustration. Not only does the burlap prevent the seed from being washed away when the lawn is watered, but it helps to retain the moisture, and the seed will germinate much more rapidly. The burlap is held against the ground with large spikes or wooden pegs. The seed underneath should be watched and the burlap removed whenever the grass requires it.

Covering a Newly Seeded Terrace with Strips of Burlap to Prevent Washing Away of Soil and Seed

### Timing Snapshot Exposures

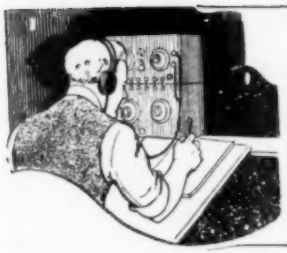
Many amateur photographers, although equipped with good cameras, fitted with fast shutters and lenses, do not succeed in making the best use of them, owing to their confusion of ideas regarding the proper time to give for the exposure. This, of course, as is well known, varies with the season as well as the time of day, and if the subject is investigated, leads to an intricate study of such technicalities as focal distances, speed of plates or films, diaphragm opening, and long formulas, all of which, on account of their complexity, are given scant attention by the average amateur, who is out for pictures instead of a course in mathematics. However, this does not minimize the value of various exposure tables and devices, for, although requiring a little time to get the proper exposure, they are worth while in preventing underexposed negatives. The professional, from long familiarity and a better appreciation of the value of light, and its action on the sensitized plate or film, rarely makes an underexposed negative, because he is taught from the first to make his exposures sufficiently long to get detail in the shadows, the lack of which, to him, is sufficient excuse for terming the negative underexposed.

For the benefit of the amateur, who generally has not the patience to calculate the exposure otherwise, a simple rule has been evolved that fits the case with sufficient accuracy to help him get better exposures, which means better pictures.

Notice the length of your shadow as indicated by some object on the ground to which the shadow just reaches, then walk toward it, counting the number of natural steps that are required to reach the object. Divide this number by 100 and the time of exposure in seconds will be obtained. This should be done only when the lens opening f-11 is used, as usually it is. Applying the rule and taking two steps, the time required for the exposure will be 1/50 second, 1/20 second if five steps are taken, 1/10 second if 10 steps are taken, and so on.

These exposures can be varied somewhat, but should be considered as a close approximation. It is understood, of course, that this rule is only applicable to outdoor photography when the sun is shining.—A. Swanson, Los Angeles, Calif.

¶The firepot of an old cannon-type stove can be used to make an attractive lawn vase.



# A TWO-STEP AUDIO-FREQUENCY AMPLIFIER

**By F. L. BRITTIN**

THIS two-step amplifier is designed to fit the short-wave receiver described in the June issue. With it, and a loud talker, speeches and music can be heard all over a large room.

The complete instrument is shown in Fig. 1; the detector and amplifier are connected by means of jumpers carried in binding posts on the panels, just as the detector and tuner units are connected. It will be necessary to drill seven more holes in the detector panel for the binding posts, to fit a two-circuit jack instead of the single-circuit one, and to make some changes in the wiring of the detector. No change is made in the wiring of the tuner, except that the jumper at the posts 3 is taken off, leaving these open. It is not necessary to remove the binding posts.

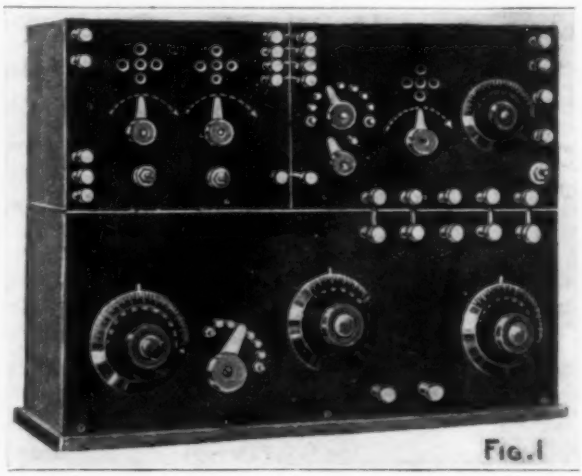


FIG. 1

**The Complete Receiver and Two-Step Amplifier: Note the Jumpers Connecting the Detector and Amplifier Units**

Those who have not already built the receiver may make the panel in one piece, laying it out by combining the dimensions given in both articles; in this case, a shelf should be fastened to the panel, above the variometers and variocoupler, to carry the tubes and transformers, and the jumpers dispensed with, the wiring being run straight through from point to point.

Two new binding posts are placed on the detector panel above the aerial binding posts A; the upper one is for the positive lead of the A-battery, and the lower for the negative. The positive binding post is connected to post 1 on the bottom of the detector panel, and to the positive filament connection on the detector-tube socket; from this latter lead a tap is taken, running to the upper one of the four new posts on the left-hand side of the detector panel. The A-battery negative post is connected to the switch lever of the detector-tube rheostat, and to the lowest jumper post at the edge of the panel. Posts 2, 4, and 5 are connected as before, but 3 is left open. The .001-mf. variable condenser is also connected as before. It may be well to remark at this point, that, though Fig. 2 shows many of the wires running parallel with each other for a considerable distance, this is done only for the sake of neatness, and to aid the reader in tracing the circuits, and that the wires must *not* be run in this manner when wiring the instrument. All wiring should be as short as possible, never running two wires parallel where it can be avoided; this cuts down self-induction and reduces the tendency of the tubes to "howl." This rule applies to the wiring of any radio instrument.

The detector B-battery switch is connected to the 22½-volt tapped unit as shown, the wire from the lever running to post 3 on the edge of the amplifier panel, and a lead from this post to the positive connection of the second-step tube filament. The two 22½-volt amplifier B-batteries need not be tapped units, as no variation in voltage is needed for the amplifier tubes. Note carefully the battery connections; all three are connected in series, the positive lead of the amplifier battery going to post 1 on the amplifier panel, and the positive lead of the detector unit to post 2. The negative lead of the detector unit goes, as before, to the end point of the switch

on the detector panel, and the negative lead of the amplifier battery to the positive post or lead of the detector battery.

The necessary parts for the amplifier, in addition to the panel and cabinet, are two V. T. sockets, two rheostats, two two-circuit jacks, two audio-frequency transformers, ratio 1 to 3, and two U.V.-201 tubes.

If a loud talker is not used, the one-way jack taken from the detector panel may be used on the second step of amplification, to save buying three two-circuit jacks. In this case the wiring shown for the loud talker, and the two binding

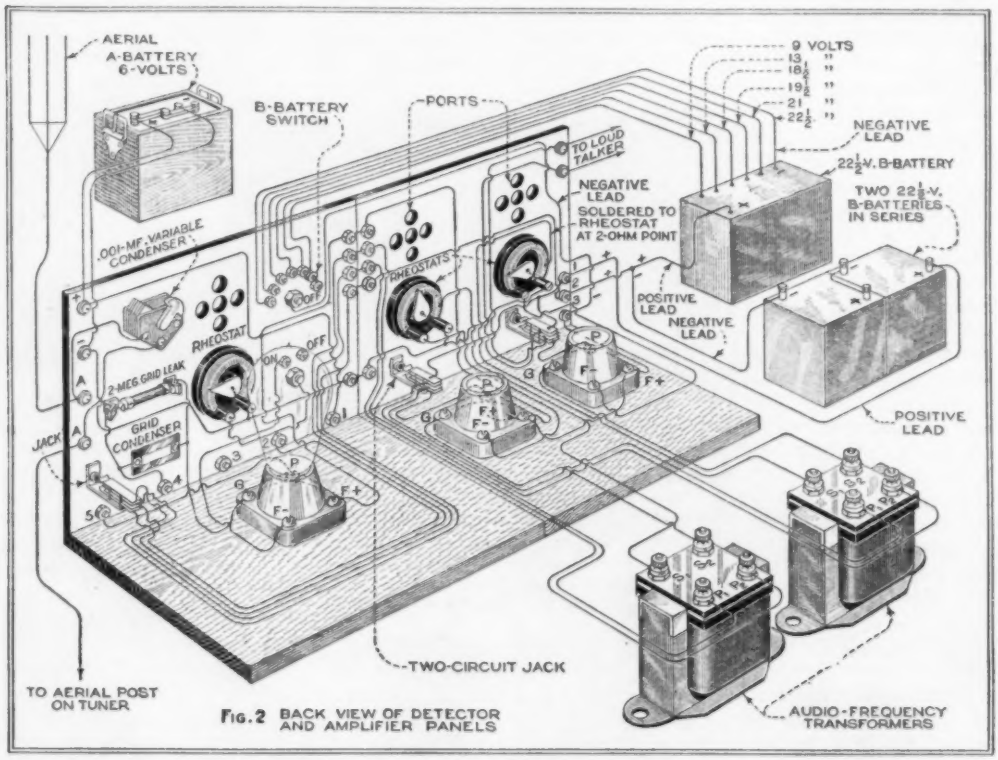



FIG. 2 BACK VIEW OF DETECTOR AND AMPLIFIER PANELS

**Back View of Detector and Amplifier Panels: The Audio-Frequency Transformers are Shown Drawn Back to Allow the Wiring to be Seen Clearly. They should be Screwed to the Base behind the Tube Sockets**

posts, may be omitted. The rheostats are mounted directly above the jacks, and below the posts; they are of the six-ohm type, made for panel mounting, similar to the one on the detector panel. Note that the secondary post $S_1$, on each transformer, is connected to its rheostat by a wire, fastened at a point about one-third of the way around the rheostat winding; in other words, at the two-ohm point. Take care that this connection is attached at the end of the winding nearest the post from which the lead is taken to the filament. If connected near the other end, the resistance will be four ohms, not two. For some tubes, the best point of operation may not be at the two-ohm point, but at some lower resistance than this. The wire should therefore be shifted along toward the resistance-winding post until, with the ear phones on, and the set in operation, the best operating point for each tube is found, testing each step separately. The wire must then be soldered to the resistance winding. The transformer is connected in this manner to hold the grid of the tubes negative, adding much to the quietness of operation of the set. This, of course, is only in the amplifier circuit. Be careful when buying tubes for the amplifier to get "hard" tubes (U.V.-201 tubes are just right), as detector tubes cannot be used for amplifying.

All wiring for the amplifier unit is No. 18 tinned-copper wire, covered with spaghetti tubing, although, as for the detector and tuner, any good insulated wire of this size will do.

This unit can be used in connection with any short-wave regenerative re-

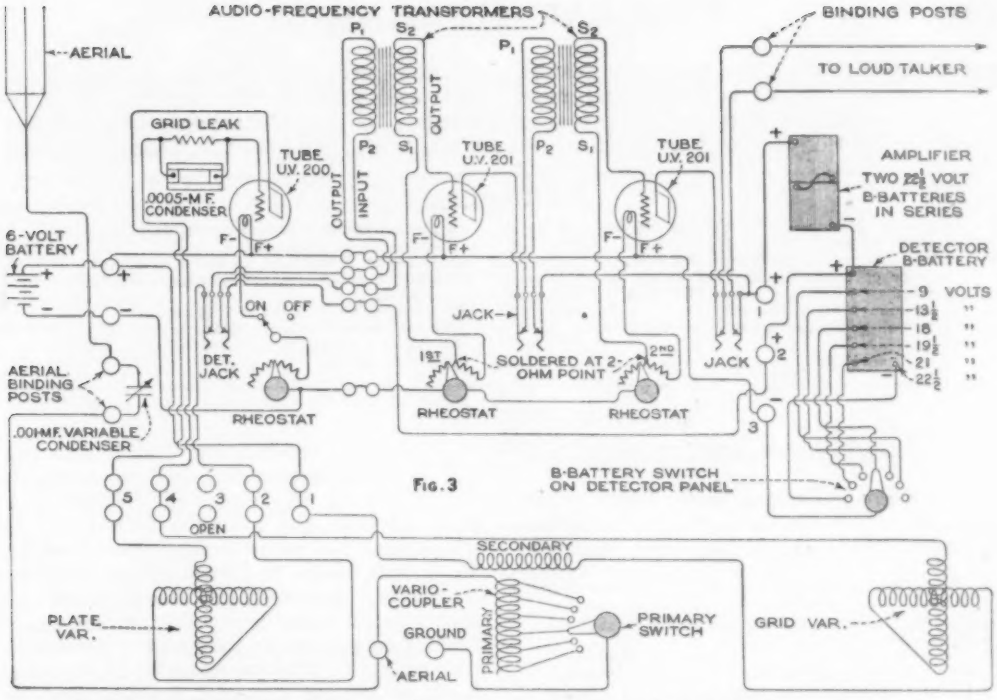



Fig. 3

**Complete Wiring Diagram for the Detector, Tuner, and Amplifier: Note Carefully the Wiring of the Detector, Comparing It with the Diagram in the June Article. A Two-Circuit Jack is Fitted on the Detector Panel Instead of the Single-Circuit One. The Latter may be Used on the Second Step, If No Loud Talker is Attached**

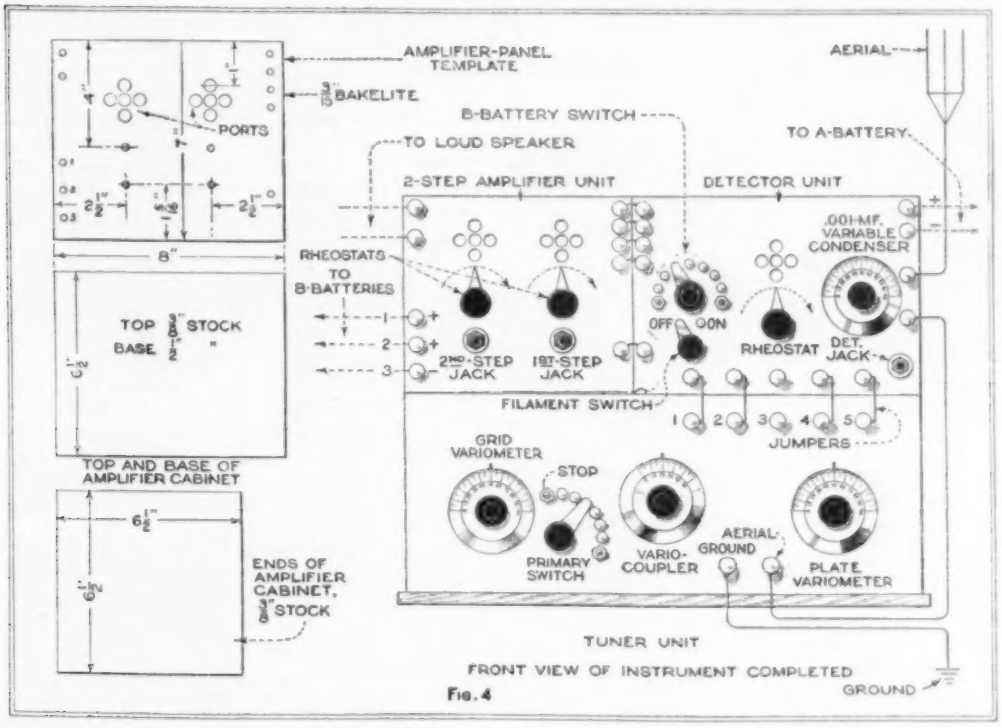



Fig. 4

**Front Elevation of Complete Instrument, Top, Base, and Ends of Cabinet, and Panel Template: The Latter should be Laid Out on Cardboard, and Used to Mark Off the Bakelite Panel. Seven New Binding Posts are Fitted on the Detector Panel; Five of These Carry Jumpers, the Other Two being Used for the A-Battery Connections. No Change is Made on the Tuner Panel**

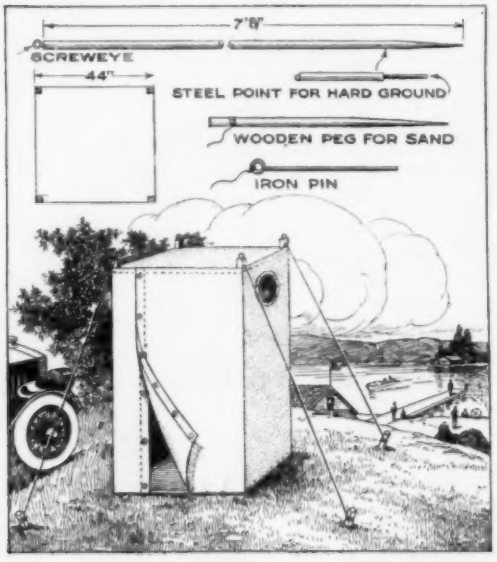
ceiver, and will give excellent results. The author receives concerts and news service from local stations on an instrument of this type, loud enough to be heard all over a large room, using a standard loud talker. The stations at Schenectady, N. Y.; Pittsburgh, Pa., and Detroit, Mich., are heard in Chicago clearly.

MATERIAL LIST

2 pieces of wood, ¾ by 6½ by 6½ in.
1 piece of wood, ⅜ by 6½ by 8 in.
1 piece of wood, ½ by 6½ by 8 in.
1 piece of wood, ¾ by 7 by 8 in.
1 piece of bakelite, 3/16 by 7 by 8 in.
2 six-ohm battery rheostats.
3 two-circuit jacks (two if no loud talker is used).
2 V.T. sockets.
2 audio-frequency transformers, ratio 1 to 3.
2 U.V.-201 amplifier tubes.
2 22½-volt B-batteries, or one 45-volt unit.
17 binding posts (preferably with black rubber knobs).
Round-head wood screws, 1 in. long.
Flat-head wood screws, 1½ in. long.
No. 18 tinned-copper wire for circuit.
Spaghetti tubing.

## A Portable Bathhouse

There are countless spots along ocean, lake, and river that would afford wonderful bathing if a bathhouse were available;




**A Portable Bathhouse That can be Rolled Up into a Compact Bundle, Lashed to the Running Board of a Car, and Set Up in a Few Minutes Where There Are No Dressing Facilities**

in its absence, the bathers must resort to dressing behind shrubbery, in the auto, or in other ways not to be recommended in thickly settled localities.

The folding bathhouse illustrated provides a means of overcoming this difficulty. Four poles, about 1½ in. square and 7 ft. 8 in. long, are required; one end of each is squared, and the opposite end is sharpened. For use on sandy beaches it will be merely necessary to push the sharpened ends into the sand, but if it is expected that the shelter will be pitched on grassy land, or along a rocky shore, it is better to drive a steel point into the end of each pole, which is done by drilling a hole in the end and driving in a piece of iron rod about a foot long, in which case the poles can be shortened by the length of the rod projecting. A large screweye is screwed into the squared upper ends of the four poles; these must hold solidly enough to stand a considerable pull. Twelve yards of 48-in. canvas, duck, or similar material, are required to cover the sides. Cut four strips 7 ft. long and two panels 48 in. square. Tack the four long strips to the four poles. By lapping 2 in. of each edge of the strips to the poles, the final result will be an inclosure 44 in. square by 7 ft. high, measuring from about 2 in. below the upper ends of the poles, which part is left projecting. Then fit the two square pieces in the top and bottom of the inclosure, turning the edges and sewing to the bottom edges of the side strips, to form the roof and floor.

Choose one side as the front, and split it down for its entire length, about a foot away from one of the corner poles. Then sew a heavy strip of canvas to the widest portion and hem the opposite edge.

Sew the edges together at the top, and fasten auto-curtain fasteners to the edges of the flaps so that they may be securely fastened together. A piece of celluloid sewed into the canvas in the manner of an auto side-curtain window will give light for the interior.

Tie a stout cord or light wire to each of the screweyes and fasten the opposite end to an iron or wooden peg. A cord or wire can be stretched between the poles on the inside of the shelter, on which the clothing can be hung. The whole can be rolled up into a compact bundle which is easily lashed across the fenders or to the running board of an automobile.

¶A currycomb makes a good fish scaler.

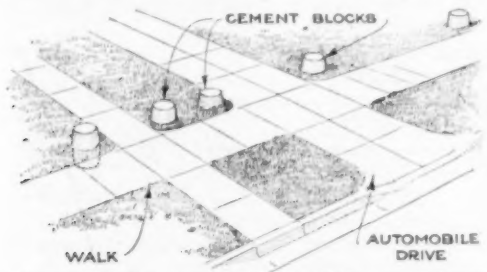
### Extracting Broken Cartridges

The sportsman, when using reloaded shells in his gun, is frequently troubled by a head breaking off and leaving the cardboard cartridge tube sticking in the chamber. If the tube sticks too tightly to be removed by ordinary methods, as it usually does, it can be removed by screwing a tap into the cardboard cylinder from the chamber end. This makes it possible, by inserting a rod in the muzzle, to drive out the cartridge by a light blow or two on the end of the rod.—George Glambeck, Milo, Can.

### Concrete Blocks Protect Walks and Lawns

To prevent pedestrians and vehicles from leaving their proper paths and getting onto the lawn, cement blocks cast in nail-keg forms are quite satisfactory.

A mixture of one part cement to five parts sand is poured into the keg forms



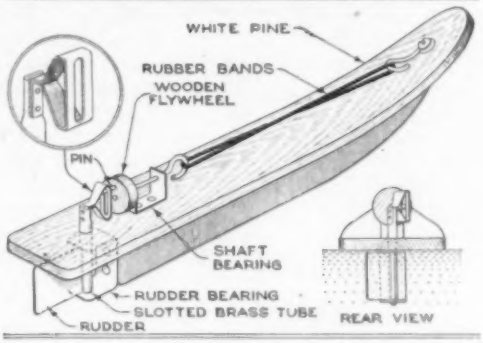

**Concrete Blocks, Cast in Molds Made from Empty Nail Kegs, are Half Buried in the Ground to Protect the Lawn from Pedestrians and Vehicles**

and allowed to harden, after which the kegs are broken away. The resulting cement blocks are half buried in the ground, wherever their use is necessary or desirable.—M. E. Duggan, Kenosha, Wisconsin.

### How to Make a "Water Skate"

A novel little water craft, using a rubber band to furnish power, has a rudder at the stern which is swung from side to side, to produce an effect exactly similar to that obtained when a rowboat is sculled forward with a single oar at the stern.

A short piece of light board is curved at the front end to form the hull of the boat, and a vertical keel is fastened to the underside. The rudder, or, more properly in this case, the propeller, is mounted in a bearing fastened to the rear end of the keel. The upper end of the rudder is provided with a slotted tiller in which the crankpin on the wooden flywheel engages. The method of supporting the flywheel and the shaft to which it is attached, as well as the manner in

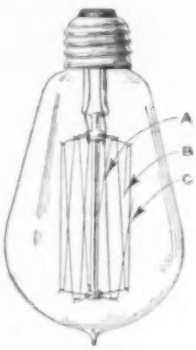



**A "Water Skate" Is a Toy Boat Made from a Piece of Light Board and Sculled Forward Exactly as a Rowboat is Propelled from the Stern**

which the rubber-band motor is hooked up, are so clearly shown in the drawing that a detailed description is unnecessary. The boat is made ready for operation by turning the flywheel so that the rubber band will be twisted tightly, producing sufficient tension to drive the little craft forward when it is placed in the water.

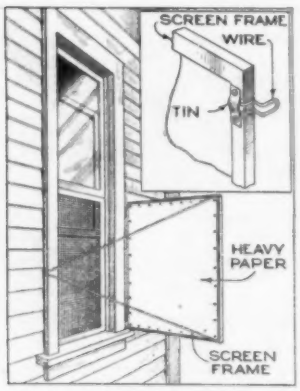
### Repairing Electric-Bulb Filaments

Many burned-out electric-light bulbs that are thrown away can be saved and restored to usefulness by the exercise of a little patience. It is necessary first to examine the bulb, and determine whether the filament can be mended, by locating the point at which it is broken. If the break occurs very near the leads, for instance, at A, between the points where the wire enters the bulb and where it passes over the first support, repair is impossible. However, if the break occurs elsewhere, between any two of the supports so that part of the filament dangles loosely, as at B and C, careful shaking and turning of the bulb will, in the majority of cases, cause the loose end to come into contact with some near-by section of the filament and complete the circuit. By carefully screwing the bulb into a socket and turning on the current, the filament will be welded into a continuous piece.



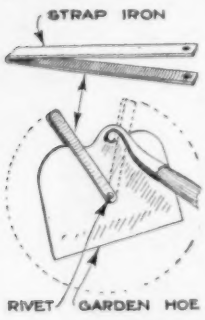
### Wind Scoop for Bedroom Window

An adaptation of the porthole wind scoops of vessels plying in tropical waters makes it possible to deflect the breeze into the bedroom during hot weather. A wooden frame is covered with stout paper, and fastened to the window frame by wire hooks that fit into the triangular openings between the frame and siding. A wire stay is hinged to the outside corners of the deflector, and it is hooked around the opposite side of the frame, as illustrated in the drawing. It requires only the work of a second to set up or take down the arrangement.




### A Novel Hoe Cleaner

One of the petty annoyances of the gardener lies in the difficulty he has in keeping the hoe from accumulating a crust of earth, as with earth clinging to the blade, it is almost impossible to make a deep, clean cut, especially in ground that is moist.




A novel and simple arrangement for keeping the hoe clean takes the form of a scraper that can be attached to any hoe in a few minutes. A hole is drilled through the center of the hoe and a steel corset stay, or similar piece of metal, is heated at the ends and middle to remove the temper. The strip is then bent double and the ends drilled to take a rivet which attaches it to the hoe in the manner shown. The rivet should be hammered down tight enough to prevent the scraper from dropping down of its own weight, where it would be in the way.

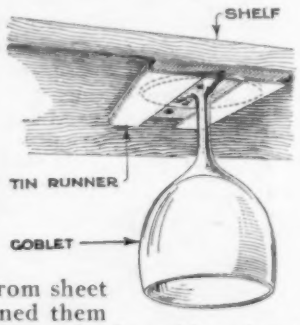
With such an attachment it is only necessary to pull the scraper around as indicated by the dotted lines, to clean the hoe quickly and thoroughly.—G. E. Hendrickson, Argyle, Wis.

### Binding Hook to Leader for Salt Water

While fishing in salt water, I had continual trouble from the fact that the binding around the hook and gut became corroded, and it would not be long until the hook would part from the leader under the strain of a struggling fish. This trouble was overcome by binding the hook and gut together with fine copper wire, which is immune to the corrosive action of ocean water.—Henry P. Fuller, Portsmouth, Va.

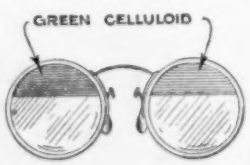
### More Room in the China Closet

A woman discovered that, by hanging the goblets and similar stemmed ware from the underside of the shelves, instead of setting them up in the usual manner, more pieces could be accommodated in the china closet. She had several sets of runners like that shown in the drawing made from sheet metal and fastened them to the underside of the china-closet shelves. The runners should be just wide enough for the bases of the goblets to slide into easily.




### Eye Protection for Motorists

Motorists who are constantly reminded by aching and burning eyes of the glare of the brilliant sunlight when driving by day, or of the flash of oncoming headlights at night, have a simple remedy in the idea illustrated. Cumbersome and unsightly goggles may be dispensed with by wearing eyeglasses or spectacles having the upper portion of each lens covered with green, blue, or amber-colored celluloid, cut to fit the lens frames. The pieces of celluloid are attached to the lenses at the rim by a light application of glue. This arrangement, while protecting the eyes against glare, allows objects to be viewed in their natural color.—Truman R. Hart, Ashtabula, Ohio.



# PRIZE OFFERS AND ANNOUNCEMENTS

### WINCHESTER REPEATING ARMS COMPANY ANNOUNCES NOVEL FISHING CONTEST

Open to amateur fishermen throughout the country is a first annual fishing contest announced by the Winchester Repeating Arms Company. The prizes offered consist of seven "Model 94" Winchester high-power hunting rifles. The fish must be caught with either a Winchester rod, line, reel, or bait, but not necessarily with more than one of these as part of the fishing equipment. The fish must be weighed on tested scales, and measured with a tape, the length to be taken from the end of the lower jaw with the mouth closed to the tip of the tail. The weight, length, girth, date, and place, and full description, if possible, of the fishing equipment used in catching the fish, must be given. Contrary to tradition, it is assumed that fishermen are not exaggerators, and no affidavit is required. All that is necessary is to fill out, according to instructions contained thereon, a blank that will be furnished by any local Winchester dealer, who will mail it to the Winchester Repeating Arms Company, New Haven, Conn.

### ANNUAL COMMERCIAL AIRPLANE CONTEST CALLED "ITALY'S GREAT TROPHY"

In order to promote the construction of airplanes for commercial use, the Italian ministry of war offers an award, called "Italy's Great Trophy," valued at 30,000 lire (normally $5,787). There will be two cash prizes awarded annually: first, 150,000 lire ($28,935); second, 50,000 lire ($9,645), and the trophy will go to the winner of the first prize. The contest is to be international, open to all air craft with a capacity of at least 550 lb. of commercial load; that is to say, besides the weight of the pilot, which will be figured at 175 lb., and of the fuel, oil, and instruments, which must include a tachometer, a clock, gauges, altimeter, compass, speedometer, and turn indicator. Before the contest any competing plane must demonstrate a minimum speed of 50 miles an hour, under full load.

The contest will take place in Italy over a circular course of 1,250 miles, or by covering that distance in smaller circles of not less than 310 miles. Three landings will be required, and at least one of them must be at night. Applications must be forwarded to the Aero Club of Italy, who will publish, each year before January 1, regulations for the ensuing contest.

### GOLD MEDAL WITH CASH TO BE AWARDED FOR EMINENT WORK IN MICROBIOLOGY

From a fund bequeathed for the purpose by the late Prof. E. C. Hansen, of Copenhagen, Denmark, a prize consisting of a gold medal, and cash to the amount of 2,000 crowns (normally about $530), will be awarded every two or three years for distinguished work in microbiology, published the preceding year in Denmark or elsewhere. This year, it is proposed to award the medal to some worker in general and not medical microbiology. The foundation is in charge of the chiefs of the Carlsberg Laboratory, at Copenhagen, and the committee of awards will be composed of eminent Danish, French, and American professors.

### FUND FOR THE ADVANCEMENT OF SURGERY PROVIDES CASH AWARDS AND MEDALS

The tenth anniversary of the death of Joseph Lister, the great English surgeon who was the originator of antiseptic surgery, is to be celebrated by the establishment of the International Lister Fund for the Advancement of Surgery. Already $60,000 has been collected, and out of this a sum of $2,500, with a bronze medal, will be awarded every three years, irrespective of nationality, in recognition of distinguished contributions to the science of surgery. The only condition connected with the award is that the recipient must give an address in London under the auspices of the Royal College of Surgeons.

### BOCHER MEMORIAL PRIZE TO BE AWARDED BY AMERICAN MATHEMATICAL SOCIETY

Soon after the death, in 1918, of Prof. Maxime Bocher, of Harvard University, a fund was raised, and turned over to the American Mathematical Society for the foundation of a prize in his memory, to be known as "The Bocher Memorial Prize." It is to be awarded at five-year intervals for a notable research memoir published in the transactions of the society during the preceding five years by a resident of the United States or Canada. The first award of $100 is to be made for a memoir published during the period 1918-22, and will be conferred at some meeting of the society in 1923. This is believed to be the first prize to be given in this country at regular intervals for research in pure mathematics, and it is considered to be a very fitting memorial to Professor Bocher, who rendered such valuable service to mathematics.

### HIGH-SCHOOL PUPILS' CONTEST FOR BEST ESSAYS ON "THE STORY OF MANKIND"

The publishers of Hendrik van Loon's "The Story of Mankind," which is one of the most widely read books of the day, are offering a prize of $100 in gold, and 40 other prizes, each of a $5 gold piece, for the best short essays upon any topic suggested by this book. The contest is open to all high-school pupils in the United States, including junior high schools, academies, and all other secondary schools. The essays must be brief—no longer than is necessary to treat the theme selected. These themes may include: a review of the book; its significance in making the study of history more attractive; a comparison with other histories; a similar treatment of some historical episode not covered by van Loon; or a description of interesting ways of using the book in school, at home, or in clubs. The essays should be typewritten, or very neatly handwritten, and must be sent before July 4, 1922, to Educational Department, The Independent, 140 Nassau Street, New York City.

### PRIZES FOR NEW OCCUPATIONS FOR SHUT-INS OFFERED BY POPULAR MECHANICS

**MANY new occupations for shut-ins and cripples were developed during the war and post-war activities, and, of course, practically every one knows about the old standard ones—such as rug weaving, beadwork, carving, etc. However, the readers of Popular Mechanics Magazine average so high in originality and resourcefulness that, no doubt, they can offer valuable new suggestions that will go far to increase the economic independence of such unfortunate persons. For the three best ideas of this nature, submitted before November 1 of this year, Popular Mechanics offers the following prizes: First, $100; second, $50; third, $25. Any other available ideas will be paid for at the usual rates. Material should be submitted in concise form, with whatever rough drawings or other illustrations may be required. All prize entries should be addressed to Prize Editor, Popular Mechanics Magazine, 6 North Michigan Avenue, Chicago, Illinois.**

## SEVERAL EXAMINATIONS FOR POSITIONS BY U. S. CIVIL SERVICE COMMISSION

The U. S. Civil Service Commission announces the following open competitive examinations:

For copyist topographic draftsmen, at salaries ranging from $900 to $1,400 a year. Applications will be received until further notice. For hydrographic and topographic draftsmen, at salaries ranging from $1,600 to $2,000 a year. Applications will be received until further notice. For junior physicist, at salaries ranging from $1,200 to $1,500 a year. To be held July 5 and Aug. 23, 1922.

For laboratorians (chemical, physical, engineering) at salaries ranging from $1,200 to $1,500 a year. To be held June 21-22 and Aug. 9-10, 1922. For laboratory assistants at salaries for junior grade, of $1,000, and for senior aid, $900 a year. To be held July 19, 1922. For assistant examiners, Patent Office, at an entrance salary of $1,500 a year, with provision for promotion to positions paying from $1,650 to $3,900 a year. To be held June 21, 22, and 23, 1922. For computers, Coast and Geodetic Survey, for duty in Washington, D. C., at $1,400 a year, and in Manila, P. I., at $2,000 a year. To be held, June 21-22, and Aug. 9-10, 1922. In all cases appointees will be allowed the bonus granted by congress of $20 a month.

All desirous of competing should at once apply for form 1312, stating title of the examination, to the Civil Service Commission, Washington, D. C., or to the Secretary of the U. S. Civil Service Board in the applicant's locality.

## CONTESTS PREVIOUSLY ANNOUNCED

**Medals, Diplomas, and Money Awards:** Announced August issue, 1921; awards offered by the Franklin Institute.

**For Service to City of Philadelphia:** Prize $10,000; announced September issue, 1921; awarded each year by Edward Bok, former editor of The Ladies' Home Journal.

**One Million Francs for Best Motor:** Announced January issue, 1922; closes June 1, 1923; address, Aero Club of France, Paris.

**Best Slogan Describing Razor:** Prize $500; announced January issue, 1922; closes June 30; address, Durham Duplex Razor Co., 190 Baldwin Ave., Jersey City, N. J.

**Best Setting of a Song:** Prize $100; announced April issue, 1922; closes July 1; address, D. A. Clippinger, 617-18 Kimball Building, Chicago, Ill.

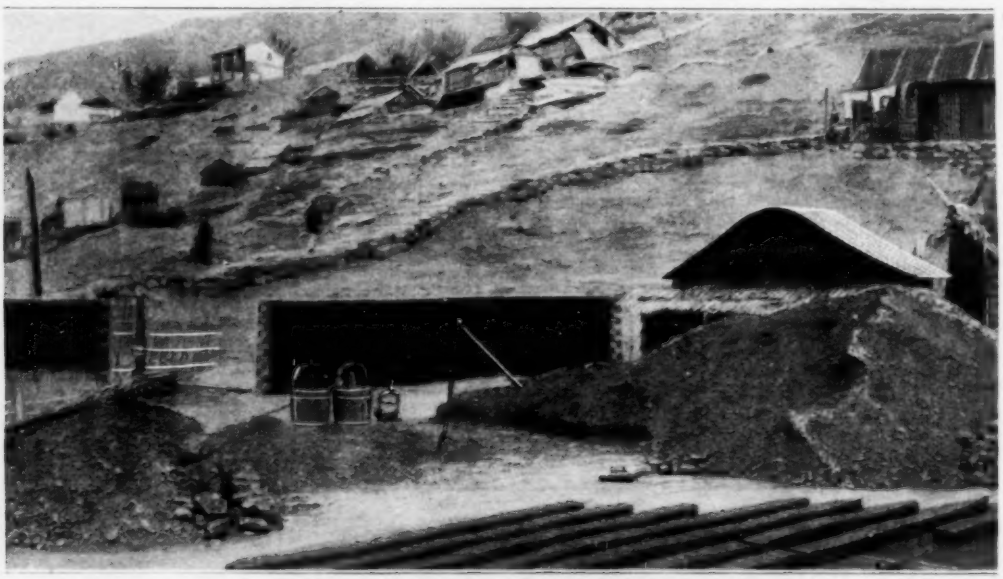
**Man-Propelled Airplane:** Prize 20,000 francs; announced April issue, 1922; closes September 13; address, Maison Peugeot, 80 Rue Danton, Levallois-Perret (Seine), France.

**For Poem on "Spirit of Transportation":** Prize $1,000; announced June issue, 1922; closes June 30, 1922; address, Clark Equipment Company, Buchanan, Mich.

**For Best System of Management of Household Expenses:** Prizes, $500, and 180 awards of $25; announced June issue, 1922; closes June 30, 1922; address, The Menter Company, 467 A Seventh Ave., New York City.

**For Best Lists of Uses for "Sanlo":** Prizes, $50, $25, $10, and three of $5 each; announced June issue, 1922; closes Aug. 31, 1922; address, Contest Department, The Parker Sanlo Co., Inc., Rochester, N. Y.

**Best Lists of Uses of Shoe Polishes:** Prizes, $500, $300, $200, 10 of $25 each, 20 of $15 each, 50 of $5 each, 50 of $2 each, and 100 of $1 each; announced April, 1922; closes Aug. 31, 1922; address, F. F. Dalley Company of New York, 277 Military Road, Buffalo, N. Y.



**A COAL-BRIQUETTING PLANT IN WESTERN CHINA**

MUCH of the coal commonly found in the outcrops on the hillsides in western China is of very friable nature, and due to the crude methods of mining and handling, much coal dust is made. Chinese economy demands that this dust be utilized, so it is made into briquettes. About equal parts of clay and coal dust are mixed with water to form a stiff paste, which is patted with the hands into wooden molds. The briquettes are about the size and shape of small building bricks. Briquettes are shown drying in the foreground, the piles of clay and coal dust farther back, and beyond that a fence made of coal briquettes. All necessary tools and machinery are in view.

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